

Williams®

Service Manual

FIREPOWER II

- OPERATION
- ADJUSTMENTS
- DIAGNOSTICS
- LOGIC AND SCHEMATIC DIAGRAMS



ROM SUMMARY

ROM	PART NO.	DESCRIPTION	BOARD	LOCATION
Game ROM 0	A-5343-10350	ROM, 4Kx8, REV 1 (Blue)	CPU	IC26
Game ROM 1	A-5343-10349	ROM, 4Kx8, REV 1 (Blue)	CPU	IC14
Flipper ROM 2	A-5343-09553	ROM, 4Kx8, REV 1 (Blue)	CPU	IC20
Flipper ROM 2	A-5341-09554	ROM, 4Kx8, REV 1 (Blue)	CPU	IC17
Sound ROM 3	A-5343-04970	ROM, 2Kx8 (White)	Sound	IC12

Special Considerations When Replacing Circuit Boards

CPU BOARD

1. Revision level 7 CPU Boards (batteries located on lower left corner of board) of later boards must be used.
2. Must be equipped with blue-labeled Flipper ROMs and Game ROMs.
3. Jumpers W3, W10, W11, W14, W17, W19, W20, and W22 must be connected. Jumpers W4, W9, W12, W15, W16, W18, W21, and W23 must be removed. With the exception of W25, (Factory Setting Jumper) all other jumpers are not changed.

DRIVER BOARD

Must be equipped with zero-ohm resistors or wire jumpers (W9-W16) in place of switch matrix drive series resistors R204-R211.

SOUND BOARD

Must be jumpered for ROM operation and be equipped with Sound ROM 13. (Jumpers W2, W5, W7, W9, W10, W12, and W15 connected; W3, W4, W6, W8, W11, and W13 removed).

POWER SUPPLY BOARD

1. Model D 8345 board required (equipped with relay).
2. Fuse F4 (10A SB) for flipper solenoids must be installed.

DISPLAY BOARDS

Model C 8363 Master Display and 7-digit Slave Displays required.

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FIREPOWER II

SERVICE MANUAL

CONTENTS

•CHAPTER 1 Game Setup

Warnings & Notices.....	6
Installation.....	6
Inspection.....	6-7
Power Turn-On.....	7
Location of Controls.....	7

•CHAPTER 2 Game Operation

Game Operation.....	10
Bookkeeping and Game Evaluation.....	10-11
Game Adjustments Procedure.....	12
Pricing Chart.....	13

•CHAPTER 3 Diagnostic Procedures

ROM Summary.....	16
Special Considerations when Replacing Circuits Boards.....	16
Self-Diagnostic Tests (including lamp, switch and solenoid charts).....	17-22

•CHAPTER 4 Drawings

Backbox Wiring Diagram.....	25
CPU Board Assembly Drawing.....	26
CPU Board Logic.....	27
Driver Board Assembly Drawing	28
Driver Board Logic Diagram (Sheet 1 of 2)	29
Driver Board Logic Diagram (Sheet 2 of 2)	31
Power Supply Assembly and Schematic Diagrams	32
Power Wiring Diagram.....	33
Sound Board Assembly Drawing.....	34
Sound Board Logic Diagram	35
Insert Board Wiring Diagram.....	37
C-8363 Master Display Board Assembly Drawing	38
C-8363 Master Display Board Logic Diagram.....	39
C-8364 and C-8365 Slave Display Board Assembly and Schematic Diagrams	40
Cabinet Wiring Diagram	41
Playfield Lamp Wiring Diagram.....	42
Playfield Solenoid Wiring Diagram.....	43
Playfield Switch Wiring Diagram.....	44
•CHAPTER 5 Unique Parts.....	46

CHAPTER 1 Game Setup

Warnings & Notices

Installation

Inspection

Power Turn-On

Location of Controls

Warnings & Notices

WARNING:

1. **FOR SAFETY AND RELIABILITY, WILLIAMS** does not recommend or authorize any substitute parts or modifications of WILLIAMS equipment.
2. **USE OF NON-WILLIAMS PARTS** and modifications of game circuitry may adversely affect game play, or may cause injuries.
3. **SUBSTITUTE PARTS, MODIFICATIONS AND GAME "CONVERSIONS"** may void FCC type-acceptance.
4. **SINCE THIS GAME IS PROTECTED** by Federal copyright, trademark and patent laws, so-called game "conversions" may be illegal under Federal law.
5. **THIS "CONVERSION" PRINCIPLE ALSO APPLIES** to unauthorized facsimiles of WILLIAMS equipment, logos, designs, publications, assemblies and games (or game features not deemed to be in the public domain), whether manufactured with WILLIAMS components or not.

RF INTERFERENCE NOTICE:

CABLE HARNESS PLACEMENTS AND GROUND STRAP ROUTING on this game have been designed to keep RF radiation and conduction within levels accepted by FCC regulations.

TO MAINTAIN THESE LEVELS, reposition harnesses and reconnect ground straps to their original placements if they should be disconnected during maintenance.

9. Remove ties securing cabinet and playfield cables and pull these cables up through pedestal hole.
10. Interconnect cabinet and playfield cables with those of backbox. All are shape, size and color-coded:
 - General Illumination Connector: 6-Pin WHITE
 - Switch Connector: 15-Pin WHITE
 - Lamp Connector: 24-Pin WHITE
 - Solenoid Connector: 36-Pin BLACK
 - Cabinet Connector: 36-Pin WHITE
11. Push Remote Volume Control Cable (GRAY), terminated in a 4-Pin connector, and Transformer Secondary Harness, terminated in four connectors: 2-Pin WHITE, 6-Pin BLUE, 9-Pin WHITE, and 12-Pin WHITE into backbox.
12. Lift up backbox and position on cabinet pedestal, engaging brackets for support.
13. Secure backbox to cabinet using two bolts and related washers.
14. Connect ground braid, and WHITE-RED wire under wing nut and washer at bottom of backbox.
15. Guide Remote Volume Control Harness through harness clips on back of backbox and connect 4 Pin connector to Sound Board 10J4.
16. Connect Transformer Secondary cable connectors:
 - 6-Pin BLUE (7 wires) to 6-Pin WHITE (7 wires)
 - 12-Pin WHITE to Power Supply 3J1
 - 2-Pin WHITE to Power Supply 3J9
 - 9-Pin WHITE to Sound Board 10J1

Installation

With legs attached to cabinet, proceed as follows:

1. Unlock and remove backglass from backbox.
2. Remove shipping insert and shipping blocks from insert door.
3. Unlatch and open insert door.
4. Unlatch speaker panel, disconnect speaker cable, and remove speaker panel. Close and latch insert door.
5. Reach into the cabinet pedestal hole and pull up the line cord. Insert the line cord into the notch in the cabinet pedestal. DO NOT PLUG IN AT THIS TIME.
6. Position backbox face-down on top of cabinet with neck opening facing rear of cabinet.
7. Pull five cable connectors from backbox.
8. Reach into pedestal hole of cabinet, pull up ground strap braid wire, and push it into backbox.

Inspection

- A. Check all connectors in backbox for loose wire termination. Reseat any loose wires by pushing in on terminal.
- B. Push on all connectors attached to Master Display, CPU, Driver, and Sound Boards, and check terminations on capacitor and bridge rectifiers at lower right of backbox.
- C. Gently press on all socketed IC packages on CPU and Sound Boards.
- D. Check that two fuses on Sound Board and seven fuses on Power Supply Board are secure.
- E. Push on connector attached to Slave Display Boards.

- F. Check that line fuse in bottom of cabinet is secure.
- G. Check transformer input connector in bottom of cabinet for loose wire termination. Reseat any loose wires by pushing in on termination.
- H. Check cabinet to coin door connector for loose wire termination. Reseat any loose wires by pushing in on termination.

Power Turn-On and Game Setup

This machine MUST BE PLUGGED INTO A PROPERLY GROUNDED OUTLET to PREVENT SHOCK HAZARD and to ensure PROPER GAME OPERATION. DO NOT use a "cheater" plug to defeat the ground pin on line cord, and DO NOT cut off ground pin. Line voltage MUST agree with that specified on the back of cabinet or serious damage to machine could occur. For low-line applications (105 or 210V ac), refer to the power wiring diagram.

- A. With the coin door closed, plug game in and turn it ON. Game should come on in Game Over mode as indicated by Player 1 score reading zero, Game Over lights lit, and High Score to Date alternating with player scores.
- B. If game comes on in the Diagnostic Mode (Credits display showing 04, Ball in Play Display showing 00, and Player 1 display showing game identification) turn game OFF and ON again.
 - 1. If game now comes on in Game Over mode, bookkeeping and game evaluation totals have been reset to zero.
 - 2. If game still comes on in Diagnostic Mode, open coin door and turn game OFF, and ON twice. This is an indication of batteries being removed with power OFF or coming loose during shipment. This has also resulted in features reverting to factory settings. Any changes from factory settings must be re-entered using procedures provided in Instruction booklet.
- C. If game still comes on in Diagnostic Mode, CPU board or memory-protect circuit may have failed.
- D. Place three balls on playfield next to outhole.
- E. Perform diagnostic tests and make any desired changes to features as described in Instruction booklet.

Location of Controls

ON-OFF SWITCH—On bottom of cabinet in the area of the right front leg as you face the game.

VOLUME CONTROL—Accessible through coin door on left cabinet wall.

DIAGNOSTIC SWITCHES—Advance, AUTO-UP/MANUAL-DOWN, and high score reset switches are located on back of coin door. Refer to diagnostic and adjustment procedures for operation.

MEMORY PROTECT SWITCH—Must be open to clear bookkeeping and make game adjustments. Located on inside of coin door frame and automatically opens when coin door opens.

CPU DIAGNOSTIC SWITCH—Operates board self test explained in diagnostic procedures. Located on left edge of CPU board.

SOUND BOARD DIAGNOSTIC SWITCH—On top edge of sound board and used to initiate sound board self test. Refer to diagnostic procedures.

SOUND SPEECH MIXER CONTROL—Used in games with speech to balance level of synthesised sound and speech. Located on speech module.

CHAPTER 2 Game Operation

Game Operation

Bookkeeping and Game Evaluation

Game Adjustments Procedure

Pricing Chart

Game Operation

Game Over Mode—Turn game ON; player 1 score shows 00; all player scores alternate the high score to date. Game Over lamp lights. All playfield lamps cycle in attract mode.

Credit Posting—Insert coins; sound produced, number of credits displayed. If maximum credits* exceeded by coin or high score to date, credits posted correctly and coin lockout de-energizes until remaining credits are below maximum. No credits may be won and coins are rejected while the coin lockout is de-energized.

Game Start—Push credit button; start-up tune played, ball served, credit display reduced by one player 1 up flashes until first scoring switch is made, ball in play shows 1. Pushing credit button before ball 2 is displayed allows additional players.

Bonus—Bonus is advanced (from 1,000 to 99,000) once by making A-B-C-D lanes, and for F-I-R-E-P-O-W-E-R targets when not lit, and three times for flipper return lanes when lit. Completing orbit shot scores 5,000 and three advances, or 10,000 and ten advances when lit for bonus holdover. Lighting A-B-C-D advances bonus multipliers (2x, 3x and 5x), and scores 25,000 points with 5x lit. Operating right flipper (Lane Change feature) alternates lit lanes.

Orbit Shot—Entering spinner lane and exiting orbit out gate completes orbit shot. Lighting F-I-R, E-P-O, or W-E-R lights individual jet bumpers for 1,000 points and Orbit Shot* arrow for ten seconds to award bonus holdover. Completing Orbit with bonus holdover arrow lit awards bonus memory for next ball. If bonus holdover has been awarded, Orbit scores 25,000 points.

F-I-R-E-P-O-W-E-R—Completing F-I-R-E-P-O-W-E-R:

- Lights one flipper return lane and spinner the first time
- Lights other flipper return lane the second time
- Lights Ramp Shot for Extra Ball the third time
- Lights FIREPOWER and one drain Special the fourth time
- Awards FIREPOWER special the fifth time
- Scores 50,000 points the sixth and succeeding times

Drain Specials will alternate by hitting kickers.

Ramp Shot—Completing Ramp Shot scores 5,000 or lit value (mystery or extra ball). Making right flipper return lane when lit lights ramp shot for Mystery value* (20,000 to 99,000) for seven seconds.

Multi-Ball—Making eject hole* scores 5,000 or lit value, and advances lit value, locks ball, and another ball is put into play. Hitting release target* scores

25,000 or lit value, advances lit value, and initiates two ball Multi-Ball. All scoring during Multi-Ball doubles except for the eject hole which scores 5,000 and ejects ball.

End of Game—If bonus holdover is lit at end of last ball the bonus and multipliers will score. Then same amount of bonus will score without multipliers to award bonus holdover. Match Digits* appear in ball in play display, credit* awarded for match. Exceeding High Score to Date awards three* credits. Match, High Score to Date, and Game Over sound made as appropriate.

Bookkeeping and Game Evaluation

(Functions 01-17)

1. Set AUTO-UP/MANUAL-DOWN switch to AUTO-UP and depress ADVANCE pushbutton. Test 04 is indicated in the credits display, Function 00 in Match display, and Game Identification in Player 1 display.
2. Operate the ADVANCE pushbutton to display Functions 01 thru 04 on the Match display (See Table 1) and record the corresponding totals (number of coins and total paid credits) from the Player 1 display. (To review a total that has been advanced past, set switch to MANUAL-DOWN and operate the ADVANCE pushbutton).
3. Operate the ADVANCE pushbutton to display Functions 05, 06, and 07 in the Match display and record the corresponding free credit totals from the Player 1 display.
4. Operate the ADVANCE pushbutton to display Function 08 in the Match display. Total credits is indicated in the Player 1 display, total free credits in the Player 2 display, and percentage of free credits in the Player 4 display.
5. Operate the ADVANCE pushbutton to display Function 09 thru 12 in the Match display and record the corresponding totals from the Player 1 display.

*Indicates game program adjustable features.

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6. Operate the ADVANCE pushbutton to display Functions 13 thru 17 in the Match display and record the corresponding totals from the Player 2 display.
7. With switch set to MANUAL-DOWN operate ADVANCE to display Function 50 in the Match Display. From Function 50 you can return to game over or zero audit totals and return to game over. Perform step 8.a. or 8.b. as desired.
8. a. To return to game over, set the switch to AUTO-UP and depress ADVANCE.
b. To zero audit totals and return to game over set switch to AUTO-UP, operate the credit button to display 35 in the Player 1 display, and depress ADVANCE.

RESETTING HIGH SCORE TO DATE

1. Using game adjustment procedure, set Function 13 to the desired reset value.
2. Depress HIGH SCORE RESET pushbutton.

FACTORY AUDIT TOTALS

(Functions 42-49)

The factory audit functions are not assigned.

Table 1. Audit Totals

FUNCTION	DESCRIPTION	
	PLAYER 1	PLAYER 2
00	Game Identification (2521 1)	—
01	Coins, Left chute (closest to coin door hinge)	—
02	Coin, center chute	—
03	Coin, right chute	—
04	Total Paid Credits	—
05	Special Credits	—
06	Replay Score Credits	—
07	Match Credits	—
08	Total Credits	Free Credits
09	Total Extra Balls	—
10	Ball Time in Minutes	—
11	Total Balls Played	—
12	Current High Score to Date	High Score to Date
13	Backup High Score to Date	Credits Awarded
14	Extra Ball 1 Score	Times exceeded
15	Extra Ball 2 Score	Times exceeded
16	Extra Ball 3 Score	Times exceeded
17	Extra Ball 4 Score	Times exceeded

Game Adjustment Procedure

(Functions 13-41)

Coin door must be open to change settings.

1. Set AUTO-UP/MANUAL-DOWN switch to AUTO-UP and depress the ADVANCE pushbutton. Test 04 is indicated in the Credits display, Function 00 in Match display, and game identification in Player 1 display.
2. To raise Function number in Match display, operate ADVANCE pushbutton with switch set to AUTO-UP. To lower Function number, operate ADVANCE with switch set to MANUAL-DOWN.
3. With desired Function indicated in Match display, raise value in player 1 display by operating credit button with switch set to AUTO-UP; lower value by operating credit button with switch set to MANUAL-
4. Repeat steps 2 and 3 until all required adjustments have been made.
5. Operate ADVANCE until Function 50 is indicated in Match display. From Function 50 you can return to game over or **restore factory settings**. Perform step 6 or 7 as desired.
6. To return to game over, depress ADVANCE with switch set to AUTO-UP.
7. To restore factory settings and zero audit totals:
 - a. Operate Credit button with switch set to AUTO-UP until 45 is indicated in Player 1 Display.
 - b. Depress ADVANCE. The game returns to Test 04, Function 00.
 - c. Set switch to MANUAL-DOWN and depress ADVANCE to indicate Function 50.
 - d. Set switch to AUTO-UP and depress ADVANCE.

Table 2. Game Adjustments

FUNCTION	DESCRIPTION	NOTES	*FACTORY SETTING
13	Backup High Score to Date (HSTD Credits Awarded)	1	2,500,000
14	Replay 1 Score (Times exceeded)	2	800,000
15	Replay 2 Score (Times exceeded)	2	1,500,000
16	Replay 3 Score (Times exceeded)	2	0
17	Replay 4 Score (Times exceeded)	2	0
18	Maximum Credits	3	30
19	Standard and Custom Pricing Control	4	01/02
20	Left Coin Slot Multiplier	4	09/09
21	Center Coin Slot Multiplier	4	04/45
22	Right Coin Slot Multiplier	4	01/18
23	Coin Units Required for Credit	4	02/05
24	Coin Units Bonus Point	4	04/45
25	Minimum Coin Units	4	00
26	Match: 00 = Match ON; 01 = Match OFF	—	00
27	Special: 00 = Awards Credit; 01 = No Special; 02 = Awards Points	—	00
28	Replay Scores: 00 = Awards Credit; 01 = Awards Extra Ball	—	00
29	Maximum Plumb Bob Tilts	—	00
30	Number of Balls (03 or 05)	—	03
31	Eject and Release Values: 00 = 1st Lamp not Lit initially; 01 = 1st Lamp Lit initially	—	01
32	Mysterytime: 00 = 5 seconds; 01 = 7 seconds	—	01
33	Holdovertime: 00 = 7 seconds; 01 = 10 seconds	—	01
34	Extra ball memory: 00 = No memory; 01 = Memory	—	01
35	Background sound: 00 = Background ON; 01 = Background OFF	—	00
36-39	Not Used	—	00
40	High Score Credits	1	03
41	Maximum Extra Balls at one time (00 = No Extra Ball)	—	07

NOTES:

*Second Factory Setting value is with jumper W25 on CPU Board connected.

[] Description in brackets shown in Player 2 Display.

1. Function 13 may be set to any multiple of 100,000 points. Setting Function 40 zero with Function 13 set to any score but zero permits the High Score to Date feature to operate but no credits are awarded.
2. Functions 14-17 (Replay Scores) may be set to any multiple of 100,000 points. Setting a function to zero disables the replay score point.
3. Setting Maximum Credits (Function 18) to zero places the game in a free play mode.
4. With Function 19 set to 00, Functions 20-25 must be set manually. Refer to Table 2 for eight standard pricing schemes (selected by values of 01-08 for Function 19) and custom pricing values. For Straight quarter play, set Function 19 to 00, Function 23 to 01 and Function 24 to 00. All other pricing functions should remain at their factory settings.

Table 3. Standard and Custom Price Settings

COIN DOOR MECHANISM	CREDITS	FUNCTION						
		19	20	21	22	23	24	25
Twin-Quarter Quarter, Dollar, Quarter	1/25¢, 3/50¢, 7/\$1 1/25¢, 3/50¢, 7/\$1 coin only 1/25¢, 7/\$1 coin only 1/25¢, 3/50¢, 6/\$1 1/25¢, 6/\$1 coin only 1/25¢, 5/\$1 2/50¢, 5/\$1 1/25¢, 5/\$1 coin only •1/25¢, 4/\$1 2/50¢, 4/\$1 •1/50¢, 2/75¢, 3/4 x 25¢ 4/\$1 or 5 x 25¢ 1/50¢, 3/\$1, 4/\$1.25 1/50¢, 3/\$1, 7/\$2 •1/50¢, 3/\$1, 6/\$2 1/50¢	00 00 00 00 00 00 00 00 01 00 05	03 03 01 01 01 01 01 01 01 01 03	12 14 07 04 06 04 04 05 04 15	03 03 01 01 01 01 01 01 01 03	02 02 01 01 01 01 01 01 01 04	12 00 00 02 00 04 02 00 00 15	00 00 00 00 00 00 00 00 00 00
1DM, 5DM, 2DM	•1/1DM, 3/2DM, 10/5DM 2/1DM, 5/2DM, 14/5DM	02 00	09 13	45 65	18 26	05 05	45 65	00 00
20-Cent, 50-Cent	1/20¢, 3/50¢	00	06	00	15	05	00	00
1 Franc, 10 Franc, 5 Franc	•1/2F, 3/5F only, 8/10F only	04	01	16	06	02	00	00
25 Cent, 1 Guilder,	•1/25¢, 4/1G 1/25¢, 5/1G	06 00	01	00	04	01	00	00
Twin 100 Yen	2/100Y	00	02	00	02	01	00	00
1 Franc or Twin-1 Franc	1/1F, 3/2F 1/1F	00 00	01 01	01 01	01 01	01 01	02 00	00 00
5 Franc, 10 Franc	•1/5F, 2/10F •1/10F	07 08	01 01	00 00	02 02	01 02	00 00	00 00
Twin-2 Franc	•1/2F	03	01	04	01	01	00	00
10, 20 Franc	•1/10F, 2/20F	07	01	00	02	01	00	00
Twin-1 Sucre	1/3S, 2/5S	00	02	00	02	05	00	00

*Indicates standard price settings by adjusting **only** Function 19. For other price settings, set Function 19 to 00 and set Functions 20 through 25 to the values indicated in the chart.

CHAPTER 3 Diagnostic Procedures

ROM Summary

**Special Considerations when
Replacing Circuits Boards**

Self-Diagnostic Tests

ROM SUMMARY

ROM	PART NO.	DESCRIPTION	BOARD	LOCATION
Game ROM 0	A-5343-10350	ROM, 4Kx8, REV 1 (Blue)	CPU	IC26
Game ROM 1	A-5343-10349	ROM, 4Kx8, REV 1 (Blue)	CPU	IC14
Flipper ROM 2	A-5343-09553	ROM, 4Kx8, REV 1 (Blue)	CPU	IC20
Flipper ROM 2	A-5341-09554	ROM, 4Kx8, REV 1 (Blue)	CPU	IC17
Sound ROM 3	A-5343-04970	ROM, 2Kx8 (White)	Sound	IC12

Special Considerations When Replacing Circuit Boards

CPU BOARD

1. Revision level 7 CPU Boards (batteries located on lower left corner at board) of later boards must be used.
2. Must be equipped with blue-labeled Flipper ROMs and Game ROMs.
3. Jumpers W3, W10, W11, W14, W17, W19, W20, and W22 must be connected. Jumpers W4, W9, W12, W15, W16, W18, W21, and W23 must be removed. With the exception of W25, (Factory Setting Jumper) all other jumpers are not changed.

DRIVER BOARD

Must be equipped with zero-ohm resistors or wire jumpers (W9-W16) in place of switch matrix drive series resistors R204-R211.

SOUND BOARD

Must be jumpered for ROM operation and be equipped with Sound ROM 13. (Jumpers W2, W5, W7, W9, W10, W12, and W15 connected; W3, W4, W6, W8, W11, and W13 removed).

POWER SUPPLY BOARD

1. Model D 8345 board required (equipped with relay).
2. Fuse F4 (10A SB) for flipper solenoids must be installed.

DISPLAY BOARDS

Model C 8363 Master Display and 7-digit Slave Displays required.

Diagnostic Procedures

DISPLAY DIGITS TEST

- Set AUTO-UP/MANUAL-DOWN switch to MANUAL-DOWN and depress ADVANCE. Displays should indicate all 0's.
- Set the switch to AUTO-UP. Displays should sequence from all 0's thru all 9's. Comma segments should come on when odd digits are displayed.
- To stop cycling, set switch to MANUAL-DOWN. Operate ADVANCE pushbutton to step through the tests one number at a time. Set switch to AUTO-UP to resume cycling.

SOUND TEST

- From Display Digits Test depress ADVANCE with the switch set to AUTO-UP. Test 00 should be indicated in the Credits display and the Match display should sequence from 00 thru 06. Different sounds should be produced for 00, 01, 02, 03, and 04.
- To continuously pulse a single sound, set the toggle switch to MANUAL-DOWN. Operate ADVANCE pushbutton to sequence through sounds one at a time. Set toggle switch to AUTO-UP to resume sequencing.

LAMP TEST

From Sound Test depress ADVANCE with the switch set to AUTO-UP. Test 01 should be indicated in the Credits display and all multiplexed lamps should flash.

COLUMN ROW \	1 YEL-BRN 2J5-8	2 YEL-RED 2J5-9	3 YEL-ORN 2J5-6	4 YEL-BLK 2J5-7	5 YEL-GRN 2J5-3	6 YEL-BLU 2J5-5	7 YEL-VIO 2J5-1	8 YEL-GRY 2J5-2
ROW	1 YEL-BRN 2J5-8	2 YEL-RED 2J5-9	3 YEL-ORN 2J5-6	4 YEL-BLK 2J5-7	5 YEL-GRN 2J5-3	6 YEL-BLU 2J5-5	7 YEL-VIO 2J5-1	8 YEL-GRY 2J5-2
1 RED-BRN 2J7-1	Game Over	1,000 Bonus	9,000 Bonus	"F"	"R"	Lower Left Jet Bumper	2x	Release Target 100K
2 RED-BLK 2J7-2	Match	2,000 Bonus	10,000 Bonus	"I"	"A"	Upper Right Jet Bumper	3x	Release Target 150K
3 RED-ORN 2J7-3	Tilt	3,000 Bonus	20,000 Bonus	"R"	"B"	Upper Left Jet Bumper	5x	Release Arrow
4 RED-YEL 2J7-4	High Score	4,000 Bonus	40,000 Bonus	"E"	"C"	Lower Right Jet Bumper	Eject Hole 10K	Spinner
5 RED-GRN 2J7-5	Shoot Again	5,000 Bonus	60,000 Bonus	"P"	"D"	Left Flipper Return Lane	Eject Hole 20K	Not Used
6 RED-BLU 2J7-6	Shoot Again	6,000 Bonus	80,000 Bonus	"O"	Left Drain Special	Right Flipper Return Lane	Eject Hole 50K	Not Used
7 RED-VIO 2J7-9	Double Score	7,000 Bonus	Bonus Holdover	"W"	Right Drain Special	Mystery	Eject Hole Lock Arrow	Not Used
8 RED-GRY 2J7-8	Bonus Holdover	8,000 Bonus	Fire Power Special	"E"	Ball in Play	Extra Ball	Release Target 50K	Not Used
	8	16	24	32	40	48	56	64

Figure 1. Lamp Matrix

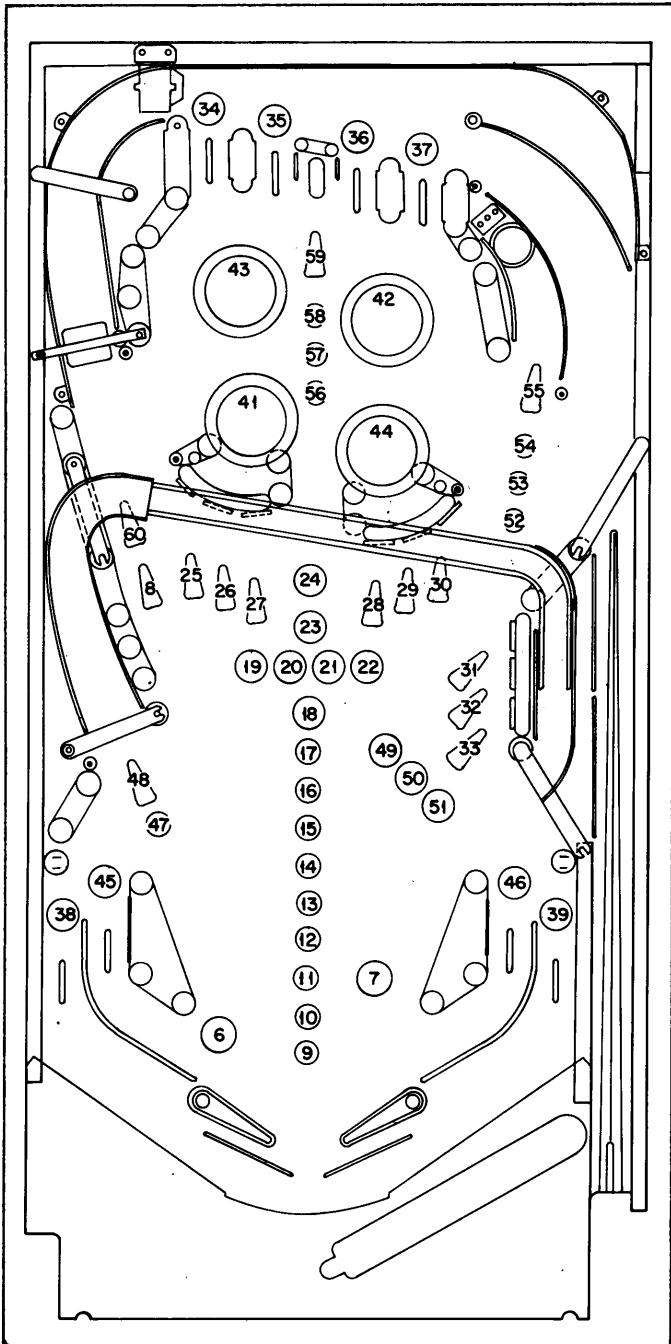


Figure 2. Lamp Locations

Lamp No.	Function
1	Game Over
2	Match
3	Tilt
4	High Score
5	Shoot Again
6	Shoot Again
7	Double Score
8	Bonus Holdover
9	1,000 Bonus
10	2,000 Bonus
11	3,000 Bonus
12	4,000 Bonus
13	5,000 Bonus
14	6,000 Bonus
15	7,000 Bonus
16	8,000 Bonus
17	9,000 Bonus
18	10,000 Bonus
19	20,000 Bonus
20	40,000 Bonus
21	60,000 Bonus
22	80,000 Bonus
23	Bonus Holdover
24	Fire Power Special
25	"F"
26	"I"
27	"R"
28	"E"
29	"P"
30	"O"
31	"W"
32	"E"
33	"R"
34	"A"
35	"B"
36	"C"
37	"D"
38	Left Drain Special
39	Right Drain Special
40	Ball In Play
41	Lower Left Jet Bumper
42	Upper Right Jet Bumper
43	Upper Left Jet Bumper
44	Lower Right Jet Bumper
45	Left Flipper Return Lane
46	Right Flipper Return Lane
47	Mystery
48	Extra Ball
49	2x
50	3x
51	5x
52	Eject Hole 10K
53	Eject Hole 20K
54	Eject Hole 50K
55	Eject Hole Lock Arrow
56	Release Target 50K
57	Release Target 100K
58	Release Target 150K
59	Release Arrow
60	Spinner
61	Not Used
62	Not Used
63	Not Used
64	Not Used

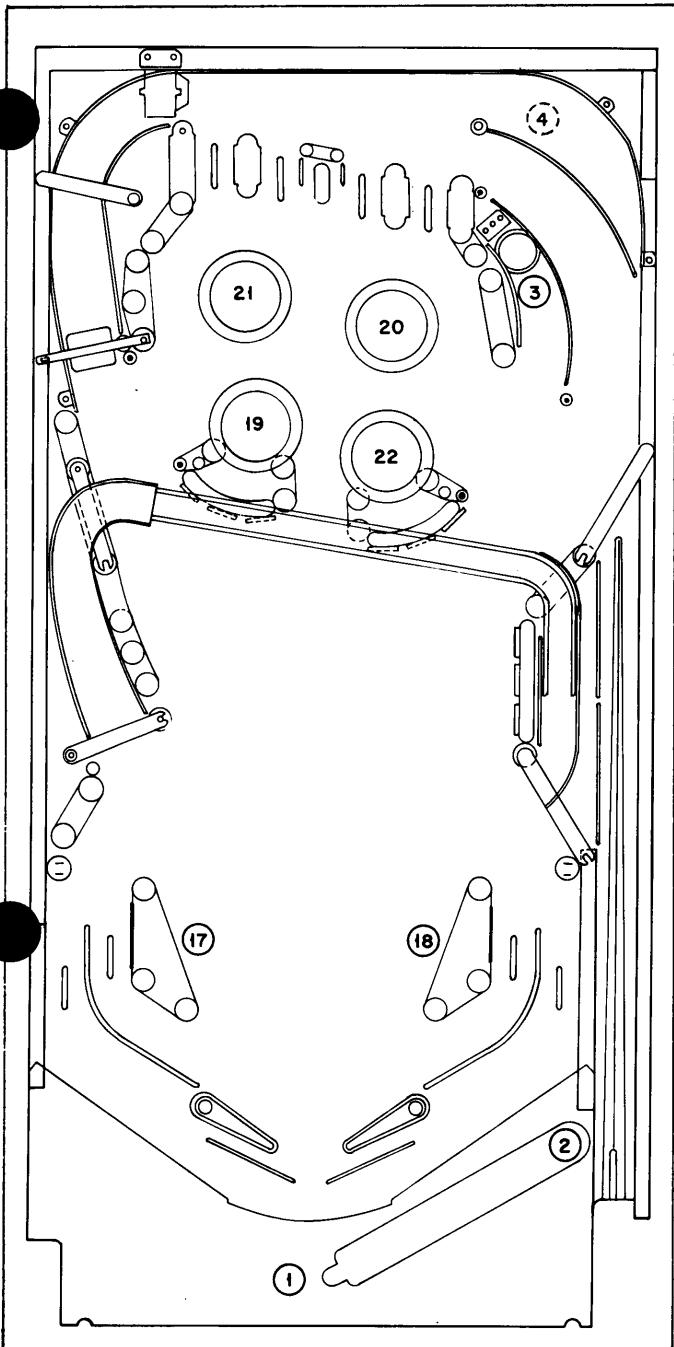


Figure 5. Solenoid Locations

SOLENOID TEST

1. From Lamp Test depress ADVANCE with the switch set to AUTO-UP. Test 02 should be indicated in the Credits display. The Match display sequences from 01 thru 25. Corresponding solenoids 01 thru 24 are pulsed. Flipper relationship is de-energized with subtest 25.
2. To continuously pulse a single solenoid set switch to MANUAL-DOWN. Operate ADVANCE pushbutton to sequence through the solenoids one at a time. Set switch to AUTO-UP to resume sequencing.

Sol.

No.	Function
1	Outhole
2	Ball Ramp Thrower
3	Eject Hole
4	Orbit Complete Flash Lamps
5	Not Used
6	Not Used
7	Not Used
8	Not Used
9	Not Used
10	Not Used
11	General Illumination Relay
12	Not Used
13	Not Used
14	Not Used
15	Bell
16	Coin Lockout
17	Left Kicker
18	Right Kicker
19	Lower Left Jet Bumper
20	Upper Right Jet Bumper
21	Upper Left Jet Bumper
22	Lower Right Jet Bumper

Table 4. Solenoid Connection

SOL. NO.	FUNCTION	WIRE COLOR	CONNECTIONS	DRIVER TRANS.	SOLENOID PART NO.
01	Outhole	GRY-BRN	2P11-4, 8P3-1	Q15	SG1-23-850-DC
02	Ball Ramp Thrower	GRY-RED	2P11-5, 8P3-2	Q17	SA3-23-850-DC
03	Eject Hole	GRY-ORN	2P11-7, 8P3-3	Q19	SG1-23-850-DC
04	Orbit Complete Flash Lamps	GRY-YEL	2P11-8, 8P3-4	Q21	Type 83
05	Not Used	GRY-GRN	2P11-9, 8P3-5	Q23	
06	Not Used	GRY-BLU	2P11-3, 8P3-6	Q25	
07	Not Used	GRY-VIO	2P11-2, 8P3-7	Q27	
08	Not Used	GRY-BLK	2P11-1, 8P3-8	Q29	
09	Not Used	BRN-BLK	2P9-9, 8P3-9	Q31	
10	Not Used	BRN-RED	2P9-7, 8P3-10	Q33	
11	General Illumination Relay	BRN-ORN	2P9-1, 3P7-1	Q35	5580-09555
12	Not Used	BRN-YEL	2P9-2, 8P3-12	Q37	
13	Not Used	BRN-GRN	2P9-3, 8P3-13	Q39	
14	Not Used	BRN-BLU	2P9-4, 8P3-14	Q41	
15	Bell	BRN-VIO	2P9-5, 7P1-17	Q43	SM-29-1000-DC
16	Coin Lockout	BRN-GRY	2P9-6, 7P1-18, 7P2-4	Q45	904218-696
*17	Left Kicker	BLU-BRN	2P12-7, 8P3-17	Q2	SG1-23-850-DC
*18	Right Kicker	BLU-RED	2P12-4, 8P3-18	Q4	SG1-23-850-DC
*19	Lower Left Jet Bumper	BLU-ORN	2P12-4, 8P3-19	Q6	SG1-23-850-DC
*20	Upper Right Jet Bumper	BLU-YEL	2P12-6, 8P3-20	Q8	SG1-23-850-DC
*21	Upper Left Jet Bumper	BLU-GRN	2P12-8, 8P3-12	Q10	SG1-23-850-DC
*22	Lower Right Jet Bumper	BLU-BLK	2P12-9, 8P3-22	Q12	SG1-23-850-DC
	Right Flipper	BLU-VIO	2P12-1, 7P1-7	—	SFL-19-400/ 30-750-DC
	Left Flipper	BLU-GRY	2P12-2, 7P1-9	—	SFL-19-400/ 30-750-DC

***NOTES:**

1. Special switch connections for solenoids 17 through 21 are as follows:

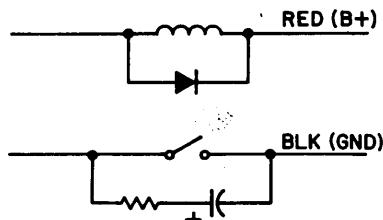
17—ORN-BRN—2P13-5, 8P3-24
 18—ORN-RED—2P13-3, 8P3-25
 19—ORN-BLK—2P13-2, 8P3-26
 20—ORN-YEL—2P13-4, 8P3-27
 21—ORN-GRY—2P13-8, 8P3-28

2. Flipper button connections are as follows:

Right—ORN-VIO—2P12-1, 7P1-7
 Left—ORN-GRY—2P12-2, 7P1-9

3. Sol. 16 is Coin-Co part number

4. Typical wiring for solenoids and special switches follows:

**SWITCH TEST**

- From Solenoid Test depress ADVANCE with the switch set to AUTO-UP. Test 03 should be indicated in the Credits display and any stuck switches in the Master display. As stuck switch(es) is displayed a sound is produced. The display continuously cycles through the stuck switches and as they are opened, the number is removed from the sequence. When all switches are open, the Match display is blank and the sounds stop.
- If all switches in a row are displayed, first verify that all are open and then check for a short to ground on the row wire.
- Operate switches; a sound is produced and switch number is momentarily indicated in the ball in play display. If two switches in a row are indicated with one switch closed, check for a short between the column wires; for multiple indication check column wire for short to ground. If two switches in a column are indicated with one switch closed, check for short between row wires
- If proper indications are obtained in Test 03 but matrix problem is suspected in game play, disconnect lamp connectors 2P5 and 2P7. Recheck game play. Perform CPU Self-Test if problem remains. If problem is cleared, check for short between lamp matrix and jet bumper mounting brackets.

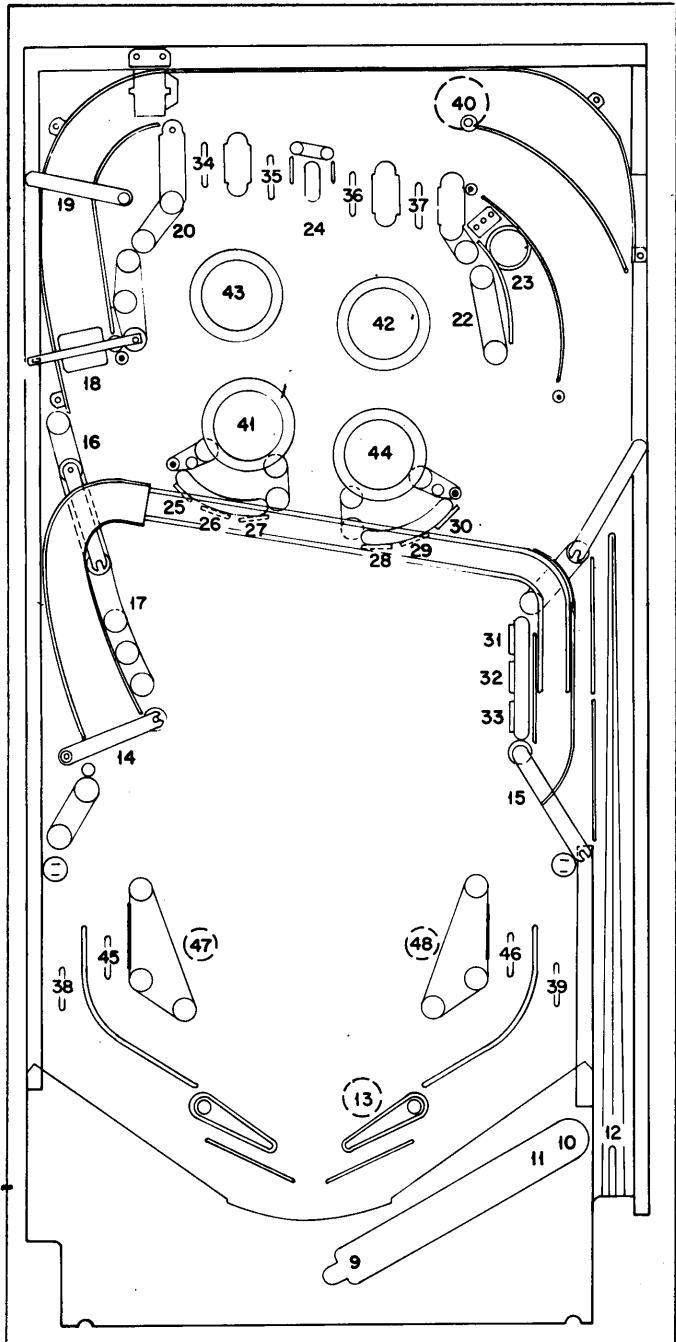


Figure 4. Switch Locations

Switch No.	Function	(Score)
1	Plumb Tilt	
2	Ball Roll Tilt	
3	Credit Button	
4	Right Coin	
5	Center Coin	
6	Left Coin	
7	Slam Tilt	
8	High Score Reset	
9	Outhole	
10	Right Ball Ramp	
11	Left Ball Ramp	
12	Ball Shooter Trough	
13	Lane Change	
14	Ramp in Roll Under	
15	Ramp out Roll Under	
16	Center Left Standup	(100)
17	Standup	(100)
18	Spinner	(100/1000)
19	Orbit in Roll Under	
20	Upper Left Standup	(50)
21	Not Used	
22	Upper Right Standup	(50)
23	Eject Hole	(5000/Lit Value)
24	Release Target	(1000)
25	"F" Target	(1000)
26	"I" Target	(1000)
27	"R" Target	(1000)
28	"E" Target	(1000)
29	"P" Target	(1000)
30	"O" Target	(1000)
31	"W" Target	(1000)
32	"E" Target	(1000)
33	"R" Target	(1000)
34	"A" Rollover	(1000)
35	"B" Rollover	(1000)
36	"C" Rollover	(1000)
37	"D" Rollover	(1000)
38	Left Outlane	(10,000)
39	Right Outlane	(10,000)
40	Orbit Out Gate	
41	Lower Left Jet Bumper	(100/1000)
42	Upper Right Jet Bumper	(100/1000)
43	Upper Left Jet Bumper	(100/1000)
44	Lower Right Jet Bumper	(100/1000)
45	Left Flipper Return Lane	(1000)
46	Right Flipper Return Lane	(1000)
47	Left Kicker	(10)
48	Right Kicker	(10)
49	Playfield Tilt	
50	Not Used	
51	Not Used	
52	Not Used	
53	Not Used	
54	Not Used	
55	Not Used	
56	Not Used	
57	Not Used	
58	Not Used	
59	Not Used	
60	Not Used	
61	Not Used	
62	Not Used	
63	Not Used	
64	Not Used	

NOTE: Second value scored when lit

COLUMN ROW \	1 GRN-BRN 2J2-9	2 GRN-RED 2J2-8	3 GRN-ORN 2J2-7	4 GRN-YEL 2J2-6	5 GRN-BLK 2J2-5	6 GRN-BLU 2J2-3	7 GRN-VIO 2J2-2	8 GRN-GRY 2J2-1
ROW	1	2	3	4	5	6	7	8
1 WHT-BRN 2J3-9	Plumb Tilt 1	Outhole 9	Standup 100 17	"F" Target 1000 25	"R" Target 1000 33	Lower Left Jet Bumper 100/1000 41	Playfield Tilt 49	Not Used 57
2 WHT-RED 2J3-8	Ball Roll Tilt 2	Right Ball Ramp 10	Spinner 100/1000 18	"I" Target 1000 26	"A" Rollover 1000 34	Upper Right Jet Bumper 100/1000 42	Not Used 50	Not Used 58
3 WHT-ORN 2J3-7	Credit Button 3	Left Ball Ramp 11	Orbit in Roll Under 19	"R" Target 1000 27	"B" Rollover 1000 35	Upper Left Jet Bumper 100/1000 43	Not Used 51	Not Used 59
4 WHT-YEL 2J3-6	Right Coin 4	Ball Shooter Trough 12	Upper Left Standup 50 20	"E" Target 1000 28	"C" Rollover 1000 36	Lower Right Jet Bumper 100/1000 44	Not Used 52	Not Used 60
5 WHT-GRN 2J3-5	Center Coin 5	Lane Change 13	Not Used 21	"P" Target 1000 29	"D" Rollover 1000 37	Left Flipper Return Lane 1000 45	Not Used 53	Not Used 61
6 WHT-BLU 2J3-4	Left Coin 6	Ramp in Roll Under 14	Upper Right Standup 50 22	"O" Target 1000 30	Left Outlane 10,000 38	Right Flipper Return Lane 1000 46	Not Used 54	Not Used 62
7 WHT-VIO 2J3-3	Slam Tilt 7	Ramp out Roll Under 15	Eject Hole 5000/Lit Value 23	"W" Target 1000 31	Right Outlane 10,000 39	Left Kicker 10 47	Not Used 55	Not Used 63
8 WHT-GRY 2J3-1	High Score Reset 8	Center Left Standup 100 16	Release Target 1000 24	"E" Target 1000 32	Orbit Out Gate 40	Right Kicker 10 48	Not Used 56	Not Used 64

Figure 3. Switch Matrix

CPU BOARD SELF-TEST

Depress the DIAGNOSTIC pushbutton on the left side of the CPU Board. The following indications are provided. With 0 indication the game returns to the game over mode.

- 0 - Test Passed
- 1 - IC13 RAM Faulty
- 2 - IC16 RAM Faulty
- 3 - IC17 ROM 2 Faulty
- 4 - IC17 ROM 2 Faulty
- 5 - IC20 ROM 1 Faulty
- 6 - IC14 Game ROM 1 Faulty
- 7 - IC26 Game ROM 0 Faulty
- 8 - IC19 CMOS RAM or Memory Protect Circuit Faulty
- 9 - Coin-door closed, Memory Protect Circuit Faulty, or IC19 CMOS RAM Faulty.

Note that "0" remaining after power turn-on indicates CPU Board lockup.

SOUND BOARD SELF-TEST

Depress DIAGNOSTIC pushbutton on the top of the Sound Board. Several electronic sounds should be produced. This sequence of sounds is repeated until the game is turned OFF and back ON.

INITIATING AUTO-CYCLE MODE

1. Set AUTO-UP/MANUAL-DOWN switch to AUTO-UP and depress ADVANCE pushbutton. Test 04 is indicated in Credit display and Function 00 in Match Display.
2. Set switch to MANUAL-DOWN and depress ADVANCE to indicate Function 50 in the Match Display.
3. Set switch to AUTO-UP and operate Credit button to indicate 15 in Player 1 Display.
4. Depress ADVANCE pushbutton to start Auto-Cycle mode. Each cycle of this mode sequences thru the Display Digits Test, Sound Test (00), Lamp Test (01), and Solenoid test (02).
5. To terminate the test and return to game over, turn the game OFF and back ON.

CHAPTER 4 Drawings

Backbox Wiring Diagram

CPU Board Assembly Drawing

CPU Board Logic

Driver Board Assembly Drawing

Driver Board Logic Diagram (Sheet 1 of 2)

Driver Board Logic Diagram (Sheet 2 of 2)

Power Supply Assembly and

Schematic Diagrams

Power Wiring Diagram

Sound Board Assembly Drawing

Sound Board Logic Diagram

Insert Board Wiring Diagram

C-8363 Master Display Board Assembly Drawing

C-8363 Master Display Board Logic Diagram

C-8364 and C-8365 Slave Display Board

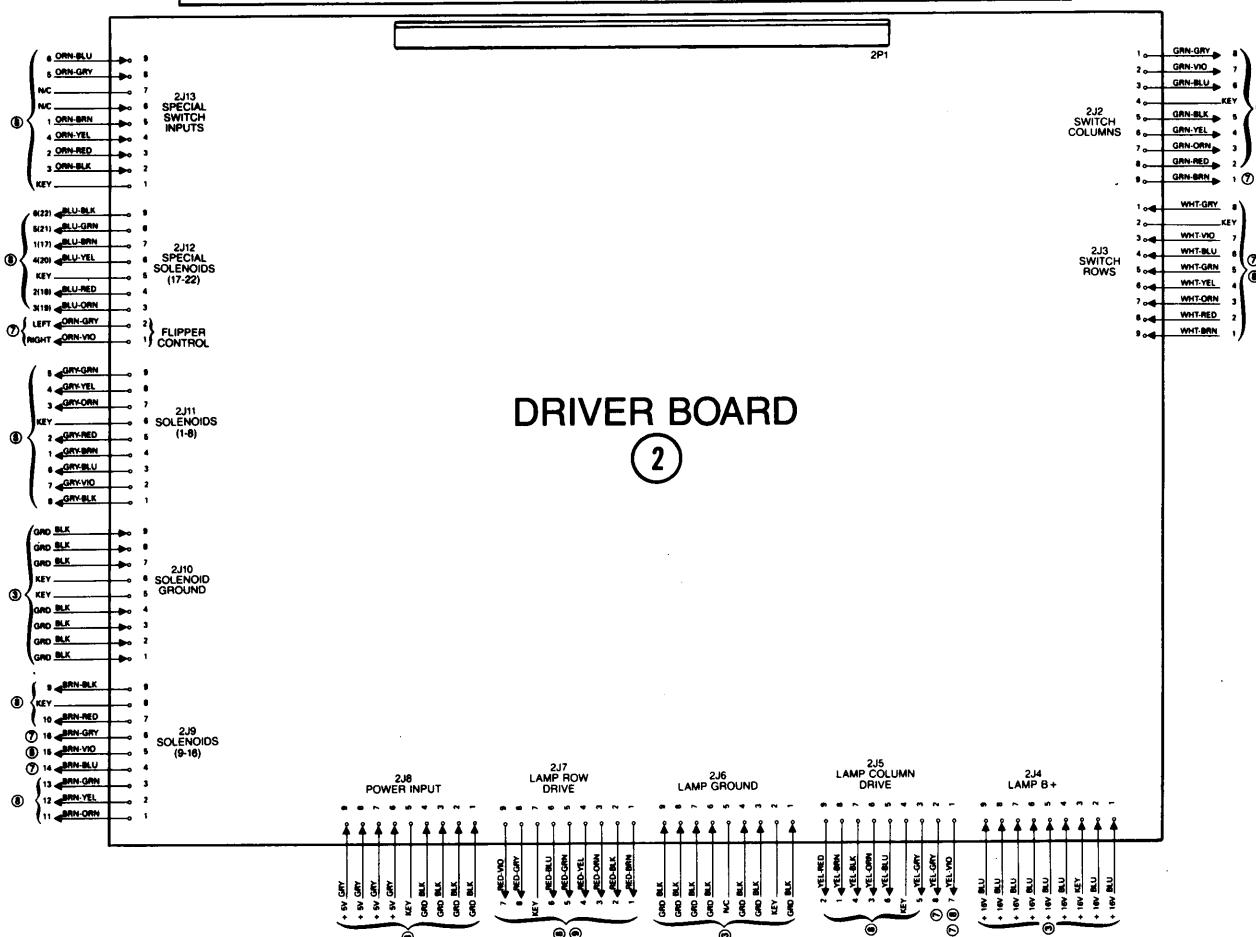
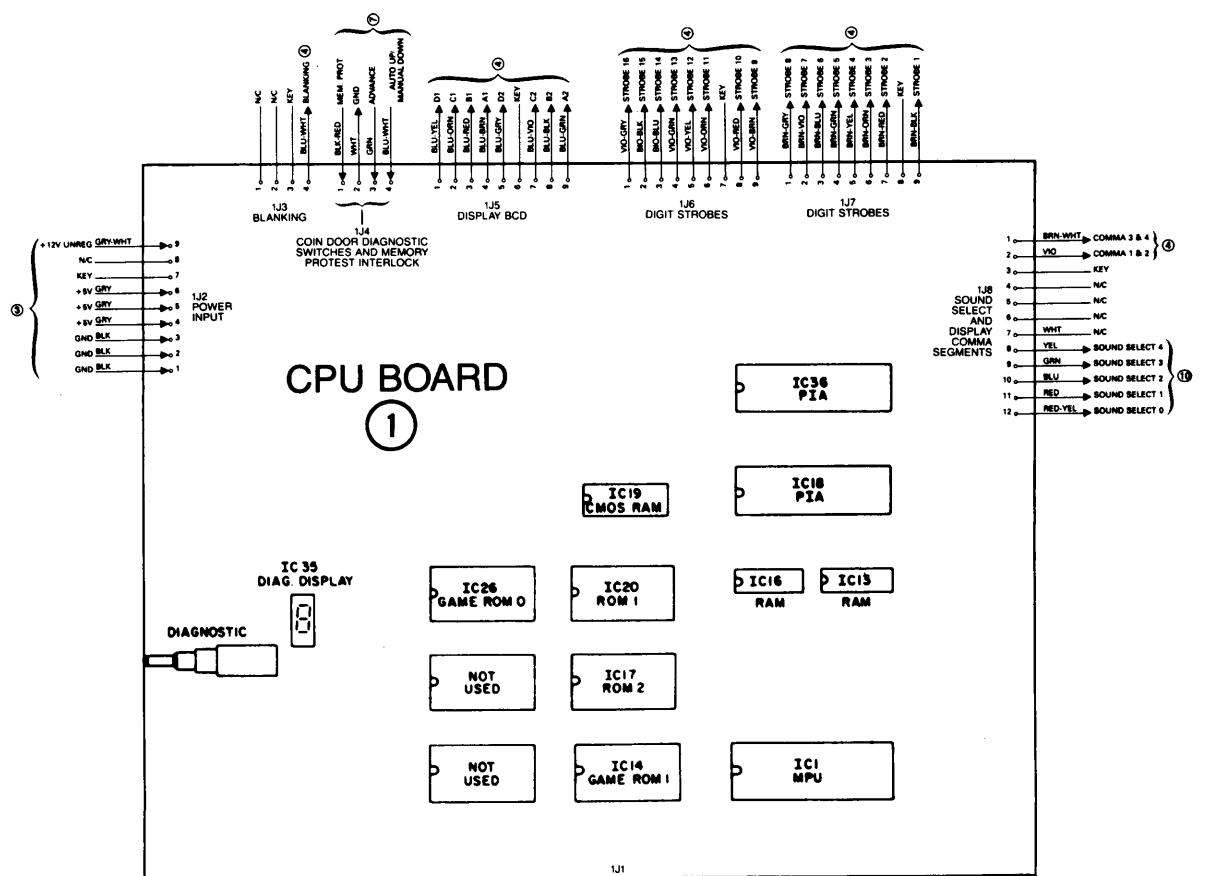
Assembly and Schematic Diagrams

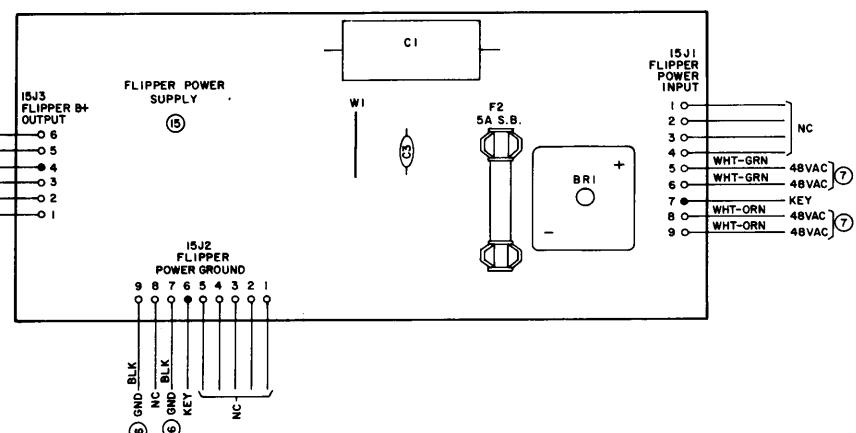
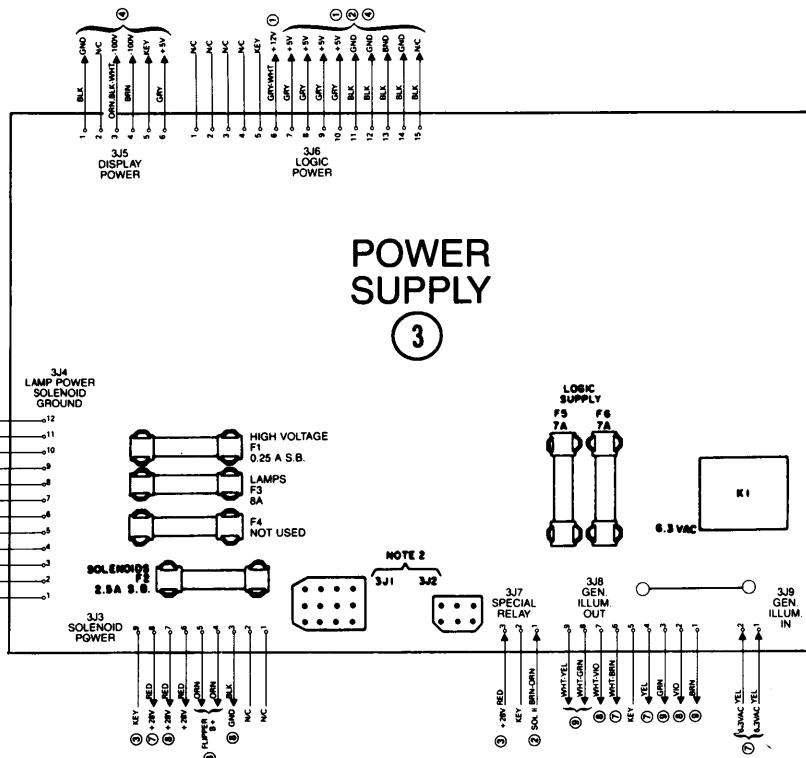
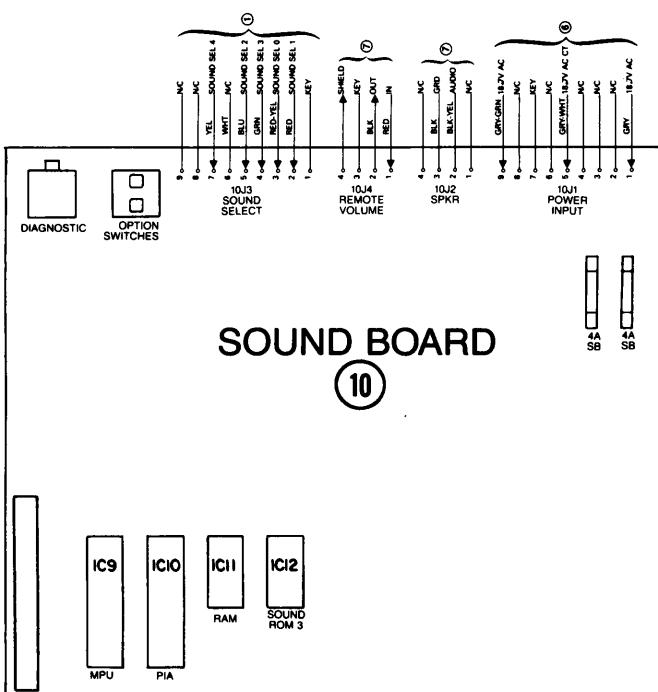
Cabinet Wiring Diagram

Playfield Lamp Wiring Diagram

Solenoid Wiring Diagram

Playfield Switch Wiring Diagram





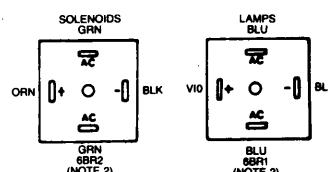
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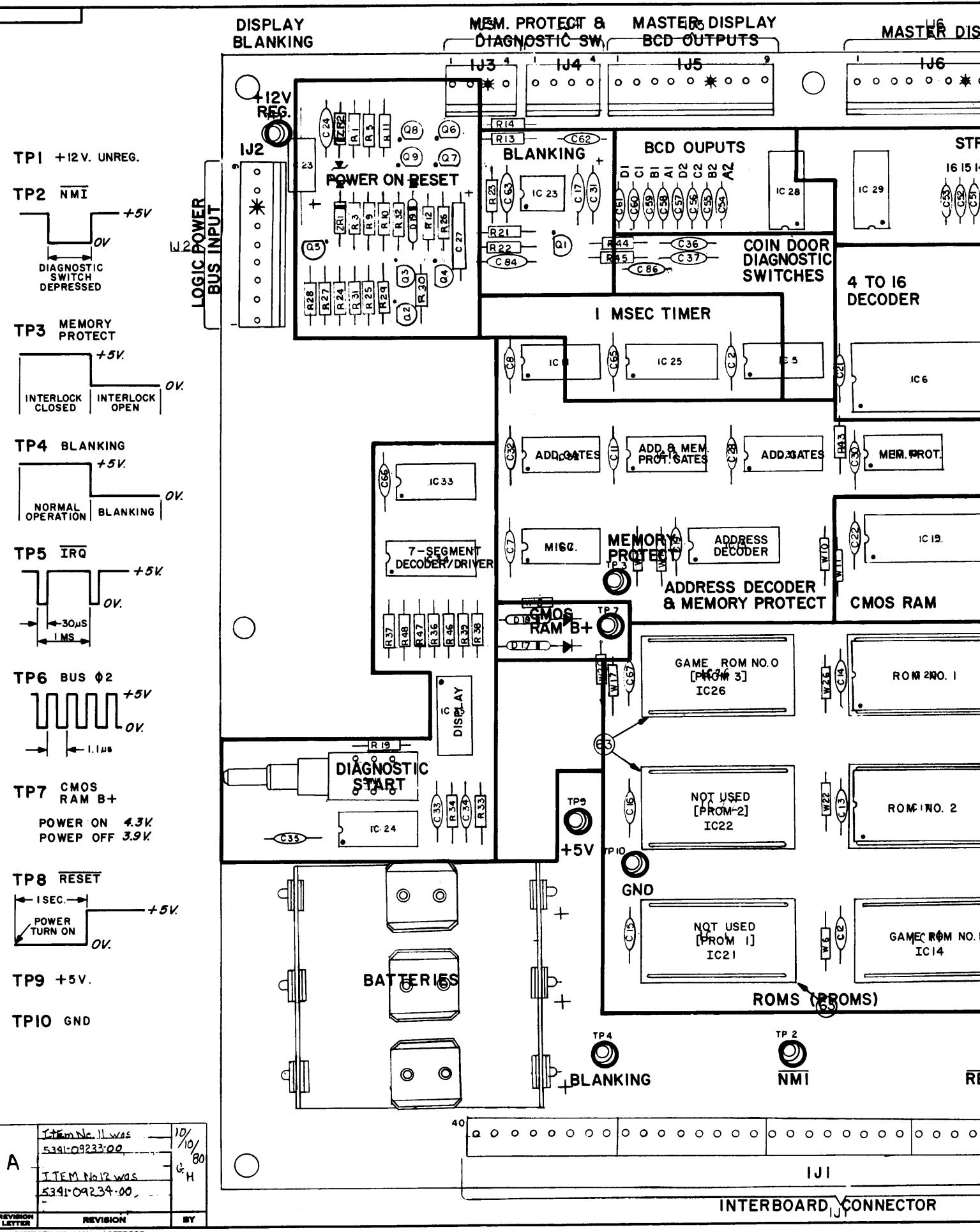
1. CONNECTIONS ARE INDICATED BY CIRCLED NUMBERS AS FOLLOWS:
 - ① CPU BOARD
 - ② DRIVER BOARD
 - ③ POWER SUPPLY BOARD
 - ④ MASTER DISPLAY BOARD
 - ⑤ SLAVE DISPLAY BOARD
 - ⑥ BACKBOX
 - ⑦ CABINET
 - ⑧ PLAYFIELD
 - ⑨ INSERT BOARD
 - ⑩ SOUND BOARD
 - ⑪ NOT ASSIGNED
 - ⑫ NOT ASSIGNED
 - ⑬ NOT ASSIGNED
 - ⑭ NOT ASSIGNED
 - ⑮ FLIPPER POWER SUPPLY

2. REFER TO POWER WIRING DIAGRAM FOR CONNECTIONS TO 3PI.

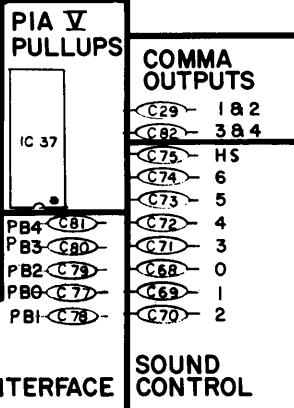
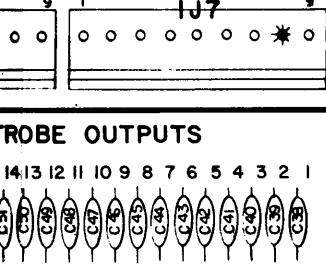
BILL OF MATERIAL FLIPPER POWER SUPPLY

ITEM NO.	PART NO.	PART DESIGNATION	DESCRIPTION
1	5768-09725-00		BARE P.C. BOARD
2	5100-09690-00	BR1	BRDG. REC. 35A 200V
3	5040-09794-00	C1	CAP. ELECTROLITIC 100 uF 250V AXIAL
4	5043-09072-00	C3	CAP. CERAMIC 0.1 uf 500V
5	5731-09651-00	F2	FUSE 5A S.B. 250V
6	5732-09178-00		FUSE HOLDER
7	5791-09453-00	15J1 & 15J2	9 PIN HEADER
8	5791-09038-00	15J3	6 PIN HEADER





SPLAY STROBE OUTPUTS



PA7
IRQ

SOUND INTERFACE

PIA V SOUND, COMMA & INTERFACE

ST8
B41 C53 R45

PIA I DISPLAY OUTPUT

RAMS

DQ7-D3 D45-D7

DATA BUS TRANSCEIVER

ADDRESS DRIVER

DO1C97

A11-A15

CRI

TP 6
BUS Ø2

IC1 C1

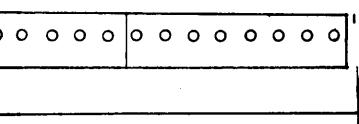
MPU & CLOCK

ADDRESS DRIVERS

A104 A5

A16-A11

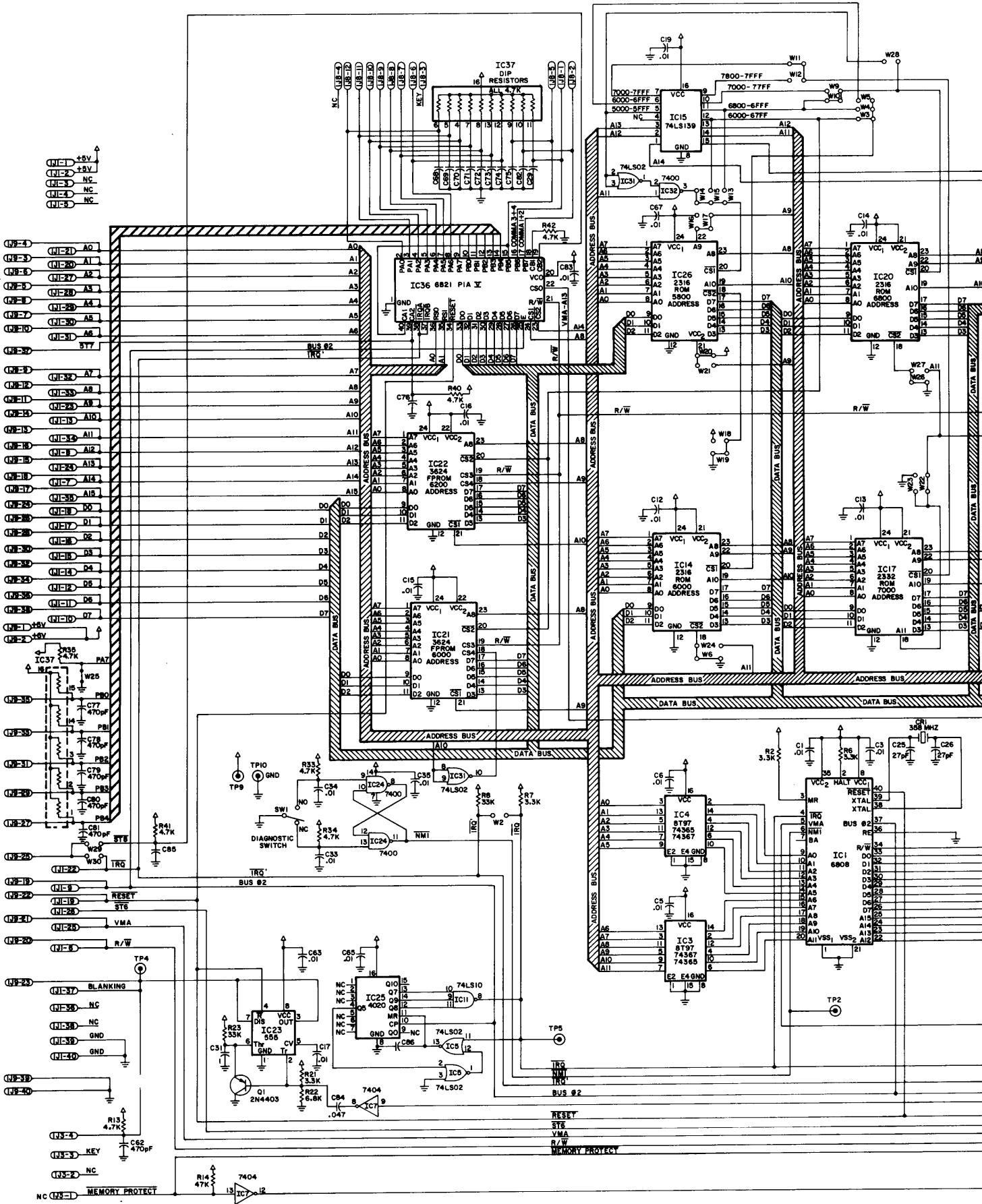
TP 8
ESET

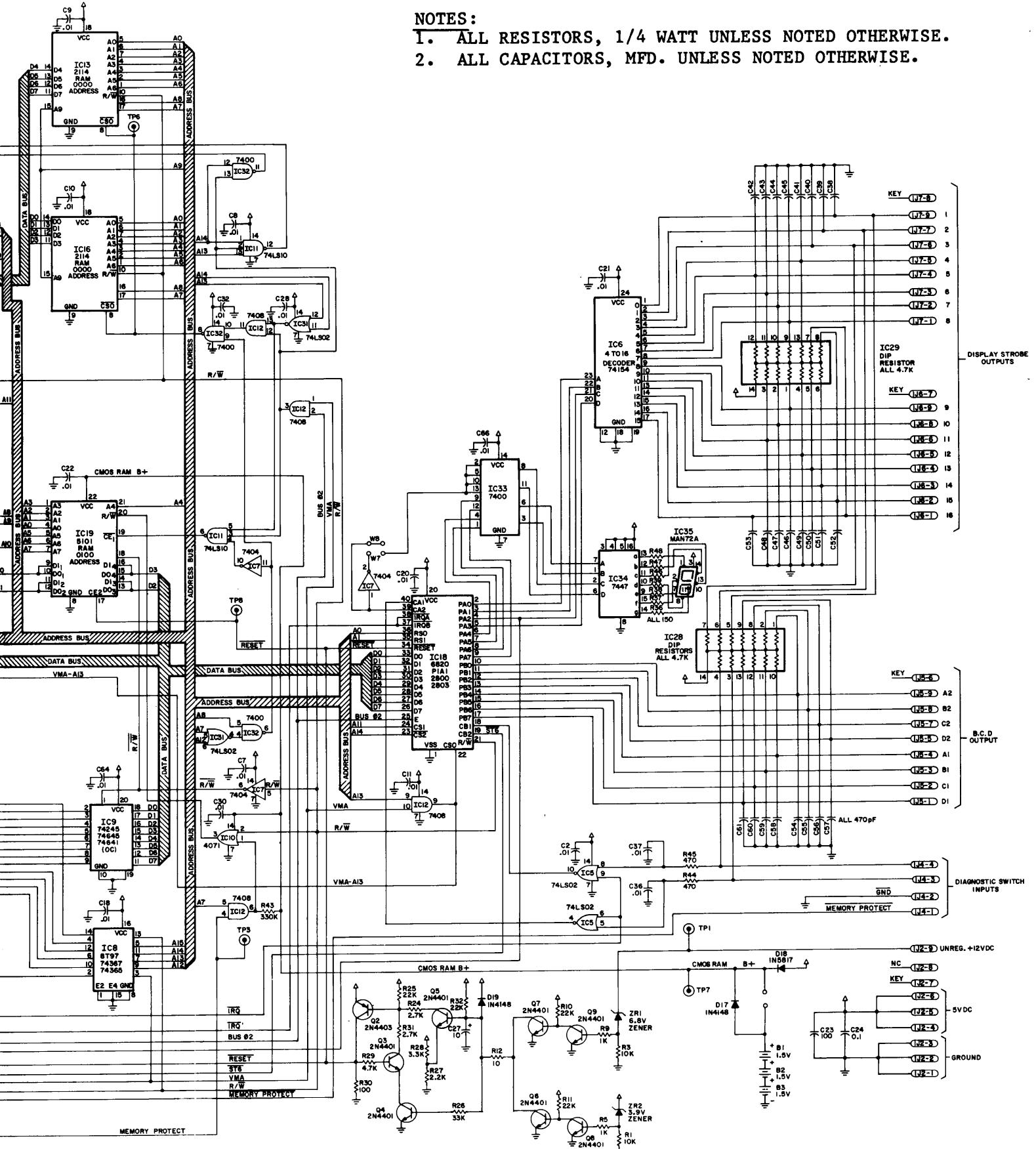


BILL OF MATERIAL			
ITEM NO.	PART NO.	PART DESIGNATION	DESCRIPTION
1	5764-09465-X0		BARE PC. BOARD CPU
2			
3	5370-08989-00	IC3,IC4,IC8	BT97 HEX TRISTATE BUFFER
4	5281-09308-X0	IC9	74LS245 OCTAL BUFFER
5	5280-09010-00	IC6	74154 4 TO 16 DECODER
6	5280-09013-00	IC7	7404 HEX INVERTER
7	5281-09235-00	IC11	74LS10 TRIPPLE 3 INVERTER
8	5280-08973-00	IC12	7408 QUAD AND
9	5340-09409-X0	IC13,IC16	2114-45 1K X4 STATIC RAM
10	5281-09246-00	IC15	74LS139 DUAL 2 TO 4 LINE DECODER
11	5341-09553-00	IC20	ROM 2K X8 LOWER
12	5341-09554-00	IC17	ROM 4KX8 UPPER
13	5340-08972-00	IC18,IC36	MC6821 PIA
14	5340-09017-00	IC19	MC 5101 CMOS RAM
15	5431-09449-00	IC23	MC 1455 PI TIMER
16	5280-09073-00	IC24,IC32,IC33	7400 QUAD 2 INPUT NAND
17	5310-09236-00	IC25	4020 CMOS 14 BIT COUNTER
18	5010-09237-00	IC10	4071 CMOS QUAD 2 INPUT NOR
19	5281-09247-00	IC5,IC31	74LS02 QUAD 2 INPUT NOR
20	5280-09407-X0	IC34	7447 BCD TO 7 SEG LED DISP
21	5671-09411-00	IC35	MAN 72A 7 SEG LED DISP
22	5019-09238-00	IC28,IC29	13 DIP RES./PACK 4.7K OHM
23	5019-09223-00	IC37	15 DIP RES./PACK 10K OHM
24	5645-09025-00	DS1,DS2	8 STD DIP SWITCHES
25	5075-09018-00	ZR1	IN5996 ZENER DIODE 6.8V
26	5074-09059-00	ZR2	IN5990 ZENER DIODE 3.9V
27	5070-08919-00	D17,D19	JN4148 DIODE
28	5160-08938-00	Q3-Q9	2N4401 NPN TRANSISTOR
29	5160-09016-00	Q1,Q2	2N4403 PNP TRANSISTOR
30	5070-09266-00	D18	IN5817 DIODE
31	5520-09020-00	CRI	CRYSTAL 3.58 MHZ
32	5010-09358-00	R5,R9,R20	RESISTOR FC 1K OHM 5% 1/4W
33	5010-08983-00	R2,R6-R8,R21,R28	RESISTOR FC 3.3K OHM 5% 1/4W
34	5010-08991-00	R13-R18,R29, R33-R35,R40,R42	RESISTOR FC 4.7K OHM 5% 1/4W
35	5010-09086-00	R22	RESISTOR FC 6.8K OHM 5% 1/4W
36	5010-09036-00	R19,R30	RESISTOR FC 100 OHM 5% 1/4W
37	5010-09187-00	R36-R39,R46-R50	RESISTOR FC 150 OHM 5% 1/4W
38	5010-09113-00	R23,R26	RESISTOR FC 33K OHM 5% 1/4W
39	5010-09024-00	R4,R5	RESISTOR FC 10K OHM 5% 1/4W
40	5010-09241-00	R25,R32,R40,R41	RESISTOR FC 22K OHM 5% 1/4W
41	5010-08998-00	R27	RESISTOR FC 2.2K OHM 5% 1/4W
42	5010-09039-00	R12	RESISTOR FC 10 OHM 5% 1/4W
43	5010-09442-00	R43	RESISTOR FC 330K OHM 5% 1/4W
44	5010-08997-00	R24,R31	RESISTOR FC 27K OHM 5% 1/4W
45	5010-09083-00	R44,R45	RESISTOR FC 470 OHM 5% 1/4W
46	5043-08980-00	C1-C22,C28,C30 C32-C37,C63-C67 C83	CAPACITOR CERAMIC .01MFID 50V
47	5040-08986-00	C23	CAPACITOR ELET. 100MFID 10V
48	5043-08996-00	C24	CAPACITOR CERAMIC .1MFID 50V
49	5043-09169-00	C25,C26	CAPACITOR CERAMIC .27PFD 1KV
50	5041-09243-00	C27	CAPACITOR TANT. .10 MFD 10V
51	5041-09031-00	C31	CAPACITOR TANT. .1MFID 25V
52	5043-09030-00	C84	CAPACITOR CERAMIC .047MFD 50V
53	5043-09065-00	C29,C38-C62 C68-C82,C85,C86	CAPACITOR CERAMIC .47OPFD 50V
54			
55	SFF NOTE		SWITCH MOMENTARY
56	5881-09021-00		BATTERY HOLDER #171
57	5791-09026-00	IJ1	HEADER 09-64-1083 8 PIN
58	5791-09028-00	IJ3,IJ4	HEADER 09-65-1041 4 PIN
59			
60	5791-09027-00	IJ2,IJ5-IJ7	HEADER 09-65-1091 9 PIN
61	5791-09043-00	IJ8	HEADER 09-65-1121 12 PIN
62	5700-08985-00		40 PIN IC SOCKET
63	5700-09004-00		24 PIN IC SOCKET
64	5010-09534-00	W3,W6,W8,W10,W11 W14,W17,W20 W25,W26,W29,W21	RESISTOR FC 0 OHM 1/4W
65	5824-09248-00	TP1-TP10	TEST TERMINALS #1502-4
			10

NOTE: USE EITHER 5641-09312-00, 5641-09024-00 OR 5641-09371-00

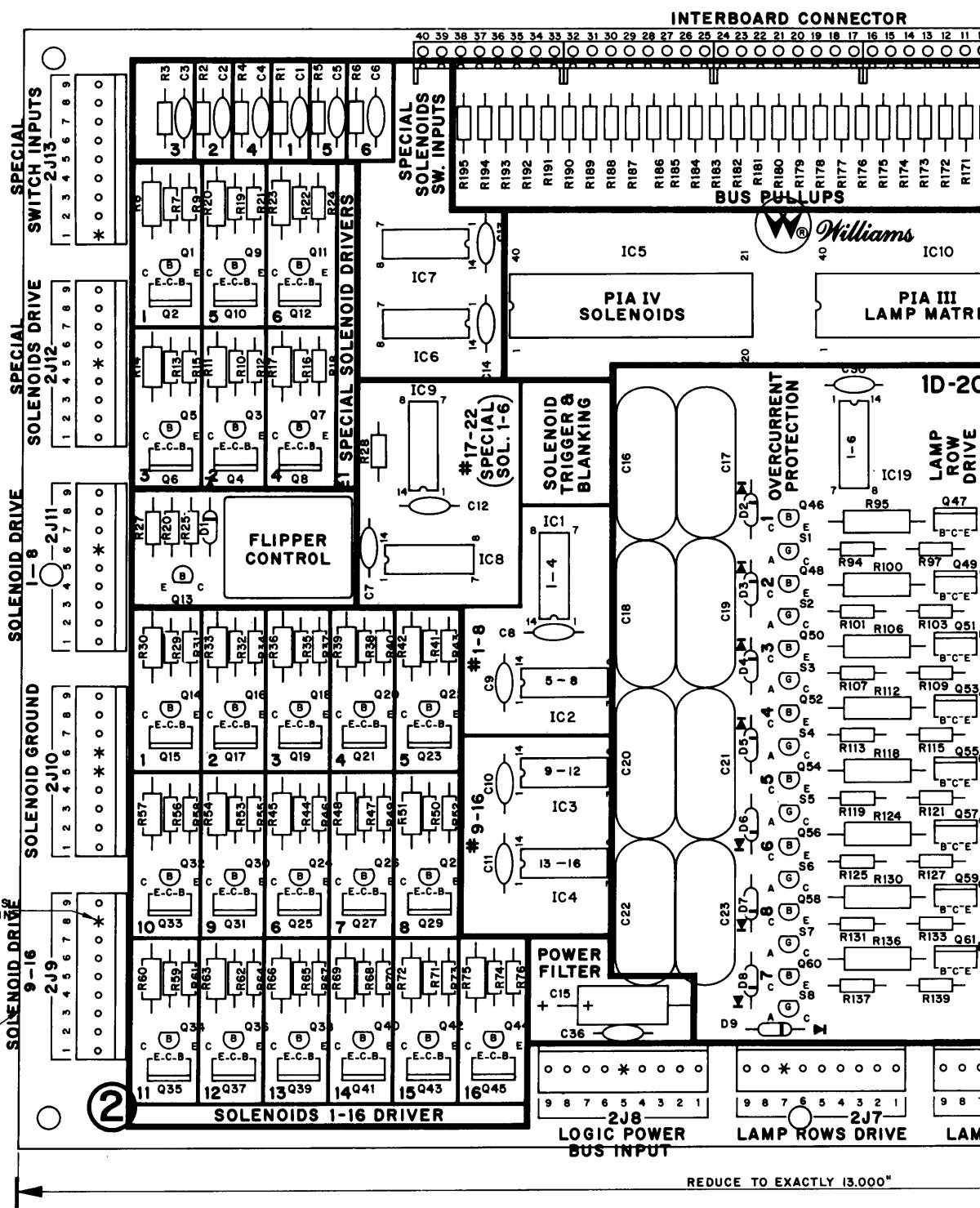
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UNLESS OTHERWISE SPECIFIED		
FRACTIONAL	.01/.04"	
DECIMAL	.0005	
HOLE SPA.	+.005-.000	
ANGULAR	.01/8°	
CONCENTRICITY	.015-.005	
SCREW THREADS	CLASS 2	
WILLIAMS ELECTRONICS, INC.		
SUBSIDIARY OF THE HARRIS CORP.		
3401 N. CALIFORNIA AVE., CHICAGO, ILL. 60616		267-2240
NAME _____		
PIN BALL CPU SUB-ASSEMBLY		
MATERIAL _____		
HEAT TREATMENT _____		
FINISH _____		
BY: G. HOBBS	DATE: 9-20-80	SCALE: D-8342

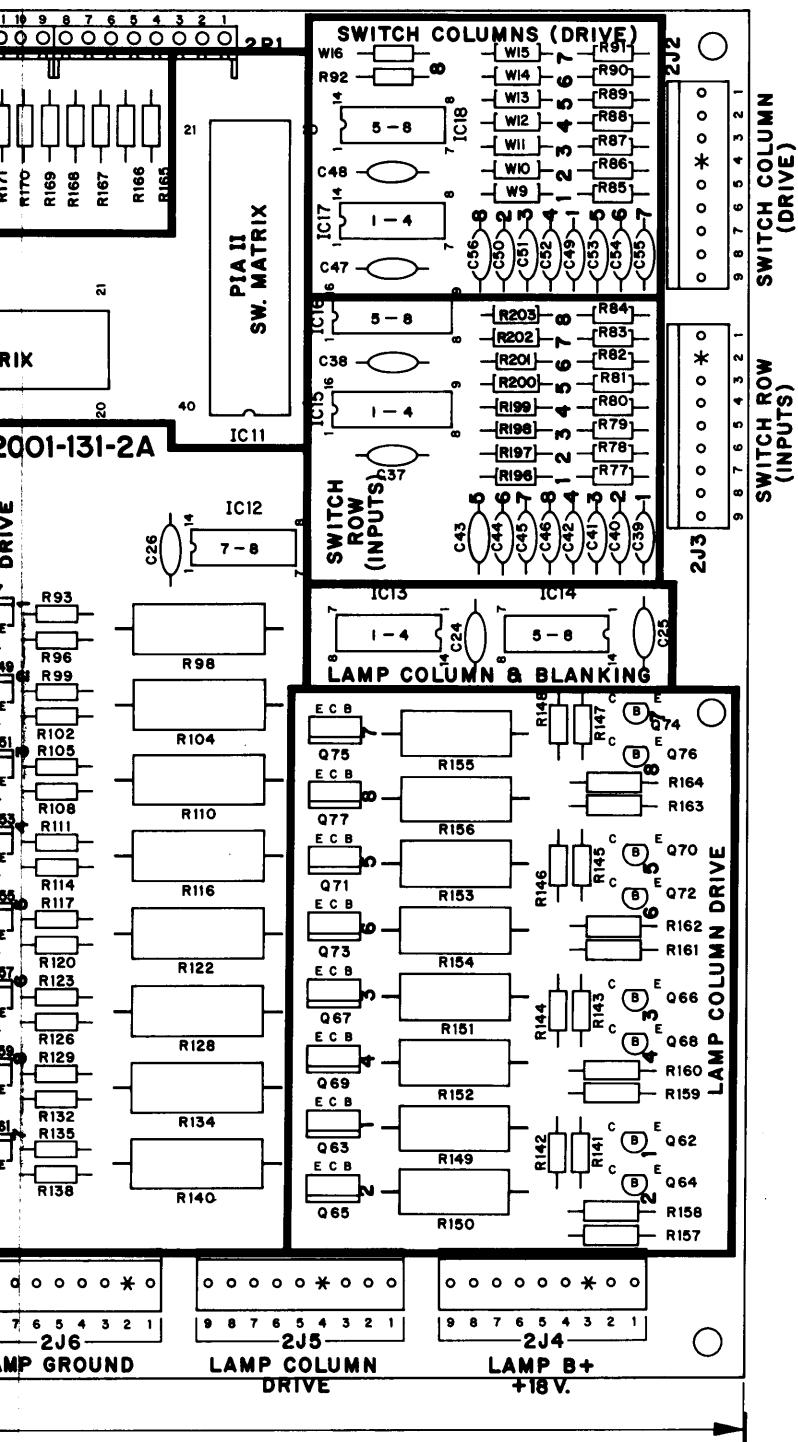




CPU Board Logic Diagram

REVISION LETTER	REVISION
C	REVISED AND REDRAWN R.GAY 11-28-77
D	ITEM NO. 28, PT.NO. WAS 5A-8999 B ADDED MOUNT- ING NOTE FOR R149 TAC R156. R.GAY 4-11-78
E	DELETED ITEM NO. 36, E.C.O. 5A-8999 C R.GAY 9-12-78
F	ADDED ITEM NO. 36 B ITEM NO. 22, DELETED (B) RESISTORS & QTY. WAS 32 E.C.O. 4624 R.GAY 10-4-78





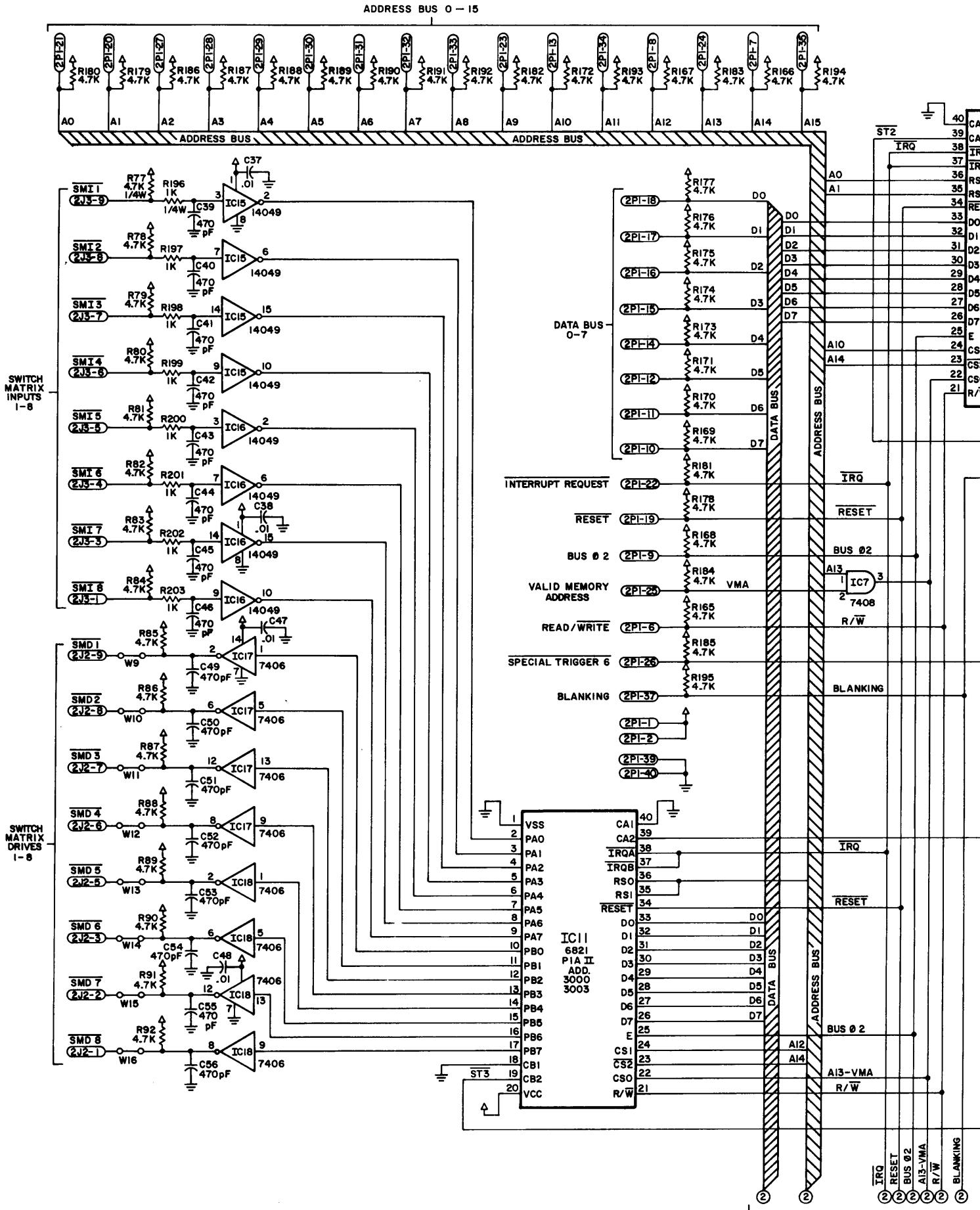
BILL OF MATERIAL

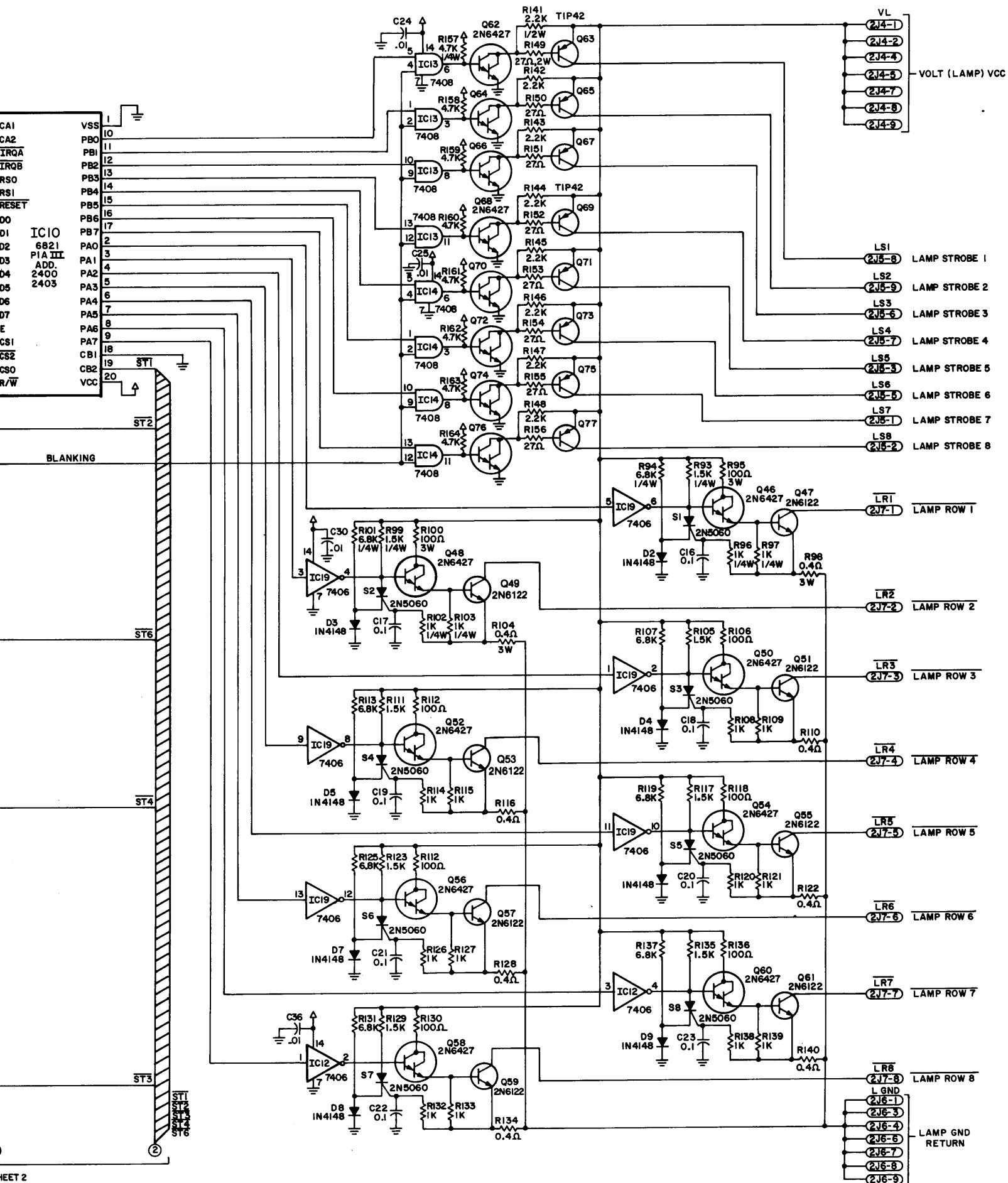
ITEM NO.	PART NO.	PART DESIGNATION	DESCRIPTION	REQ'D. NO.
1	1B-2001-131		BARE P.C. BOARD	1
2	5A-8948	IC8, IC9	N7402 QUADRUPLE 2 INPUT POSITIVE AND GATE	2
3	5A-8974	IC12, IC17, IC18, IC19	N7408 HEX INVERTER BUFFER DRIVERS W/ OPEN COLLECTOR HIGH VOLTAGE OUTPUTS	4
4	5A-8973	IC1 THRU IC4, IC6, IC7, IC13, IC14	N7408 QUADRUPLE 2 INPUT POSITIVE AND GATE	8
5	5A-8975	IC15, IC16	MC14049 INVERTING HEX. BUFFER	2
6	5A-8972	IC5, IC10, IC11	MC6820 PERIPHERAL INTERFACE ADAPTER	3
7	5A-8930	Q1, Q3, Q5, Q6, Q10, Q13, Q14, Q16, Q18, Q22, Q24, Q26, Q28, Q30, Q32, Q34, Q36, Q38, Q40, Q42, Q44	2N4401 NPN TRANSISTOR	23
8	5A-8976	Q46, Q48, Q50, Q52, Q54, Q56, Q58, Q60, Q62, Q64, Q66, Q68, Q70, Q72, Q74, Q76	2N6427 DARLINGTON NPN TRANSISTOR	16
9	5A-8977	Q2, Q4, Q6, Q8, Q10, Q12, Q15, Q17, Q19, Q21, Q25, Q27, Q29, Q31, Q33, Q35, Q37, Q39, Q41, Q43, Q45	TIP122 DARLINGTON NPN POWER TRANSISTOR	22
10	5A-8978	Q63, Q65, Q67, Q69, Q71, Q73, Q75, Q77	TIP42 PNP POWER TRANSISTOR	8
11	5A-8979	Q47, Q49, Q51, Q53, Q55, Q57, Q59, Q61	2N6122 NPN POWER TRANSISTOR	8
12	5A-6258	D1	IN4001 DIODE	1
13	5A-8919	D2 THRU D9	IN4148 DIODE	8
14	5A-9014	S1 THRU S8	2N5060 SCR	8
15	5A-8980	C1 THRU C14, C24, THRU C26, C30, C37, C38, C47, C48	CAPACITOR, CERAMIC, .01 MFD. +80-20% 50 V.	22
16	5A-8995	C16 THRU C23	CAPACITOR, POLYESTER FILM, 1 MFD. 10%	7
17	5A-9065	C37 THRU C46, C49 THRU C56	CAPACITOR, CERAMIC, 470 PFD. 20% 50 V.	16
18	5A-8986	C15	CAPACITOR, ELECT., 100 MFD. 10 V.	1
19	5A-8996	C36	CAPACITOR, CERAMIC, 1 MFD. +80-20% 50 V.	1
20	5A-8991	R1 THRU R6, R27, R77 THRU R92, R157 THRU R193	RESISTOR, FC, 4.7 K OHM 10% 1/4 W	62
21	5A-8983	R27	RESISTOR, FC, 3.5 K OHM 10% 1/4 W	1
22	5A-8984	R96, R97, R102, R103, R105, R106, R107, R112, R122, R128, R132, R133, R138, R139, R156, R157	RESISTOR, FC, 1K OHM 10% 1/4 W	24
23	5A-8992	R7, R10, R13, R16, R19, R22, R25, R32, R35, R38, R41, R44, R47, R50, R53, R56, R59, R62, R65, R68, R71, R74	RESISTOR, FC, 560 OHM 10% 1/4 W	22
24	5A-8993	R6, R11, R14, R17, R20, R23, R30, R33, R36, R39, R42, R45, R48, R51, R54, R57, R60, R63, R66, R69, R72, R75	RESISTOR, FC, 68 OHM 10% 1/2 W	22
25	5A-8997	R9, R12, R15, R18, R21, R24, R25, R31, R34, R37, R40, R43, R46, R49, R52, R55, R58, R61, R64, R67, R70, R73, R76	RESISTOR, FC, 2.7 K OHM 10% 1/4 W	23
26	5A-8817	R26	RESISTOR, FC, 10 K OHM 10% 1/4 W	1
27	5A-8998	R141 THRU R148	RESISTOR, FC, 2.2 K OHM 10% 1/4 W	8
28	5A-8999-1	R149 THRU R156	RESISTOR, FC, 27 OHM 10% 2 W	8
29	5A-9084	R95, R100, R106, R112, R116, R124, R130, R136	RESISTOR, FC, 100 OHM 10% 3 W	8
30	5A-9085	R93, R98, R105, R111, R117, R123, R129, R135	RESISTOR, FC, 1.5 K OHM 10% 1/4 W	8
31	5A-9086	R94, R101, R107, R113, R119, R125, R131, R137	RESISTOR, FC, 6.8 K OHM 10% 1/4 W	8
32	5A-9037	R98, R104, R110, R116, R122, R128, R140	RESISTOR, WIREWOUND, .4 OHM 10% 3 WATT	8
33	5A-8994	Z1	RELAY - 4 POLE - 5 AMP. CONTACTS 40 OHM COIL 6 V.D.C.	1
34	5A-9086	2P1	8 PIN RECEPTACLE	5
35	5A-9027	2J2 THRU 2J15	9 PIN HEADER	12
36	5A-2534	W9 THRU W16	RESISTOR, FC, 0 OHM, 1/4 W	8

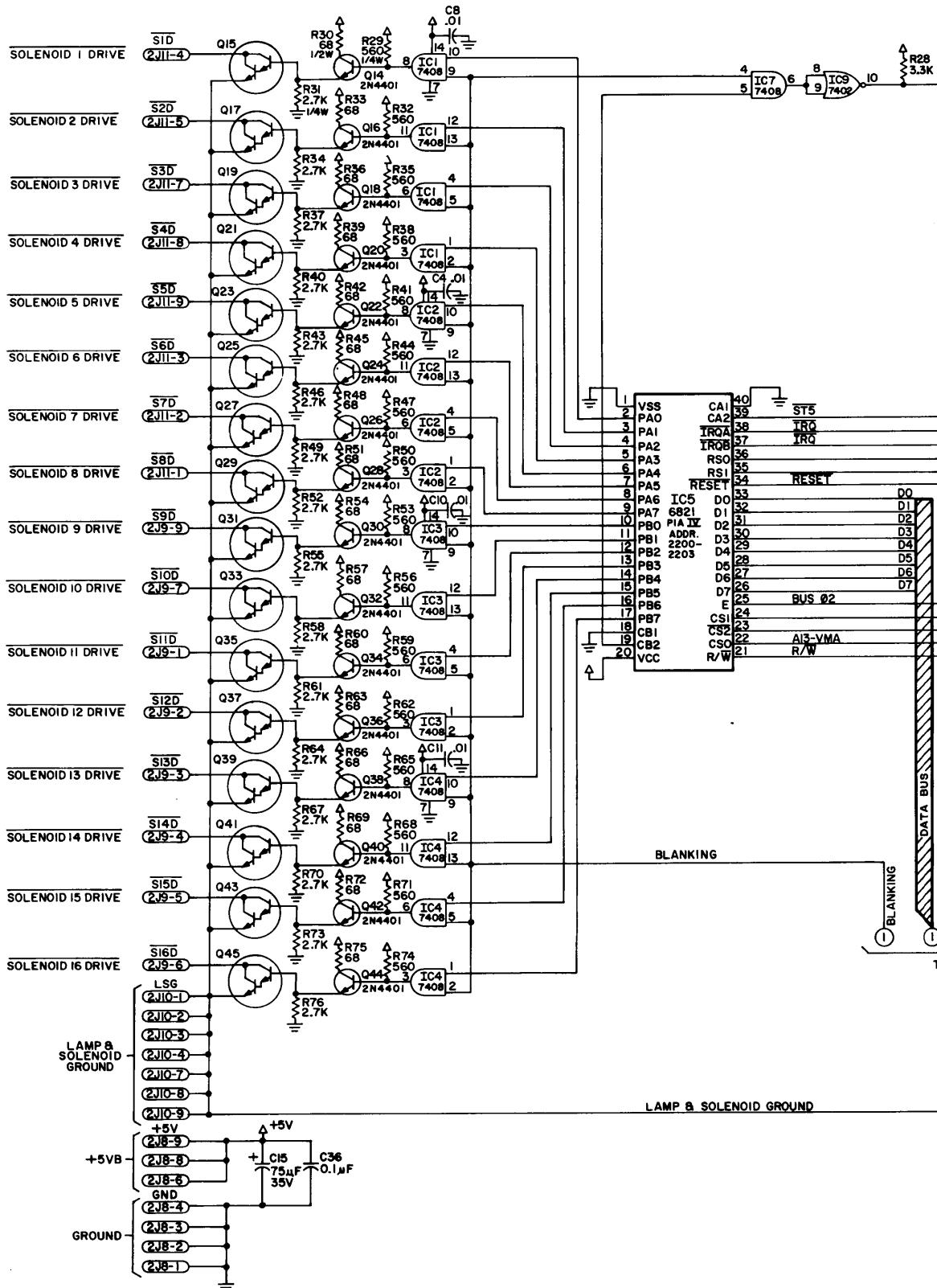
★ R149 THRU R156 MUST BE MOUNTED $\frac{1}{8}$ " ABOVE SURFACE OF BOARD.



WILLIAMS ELECTRONICS, INC. SUBSIDIARY OF XCOR CORPORATION 3401 N. CALIFORNIA CHICAGO, ILL. 60618 CORNELIA 7-2240				
PART NAME DRIVER BOARD ASSEMBLY				
DOWN: R. Gay	DATE: 8-16-77	APP'D: 1	SCALE: 2-1	PART NO. D-7997

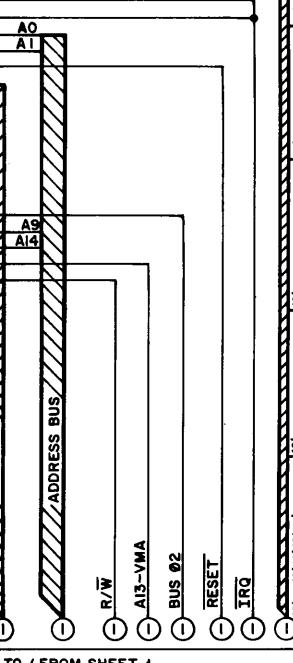




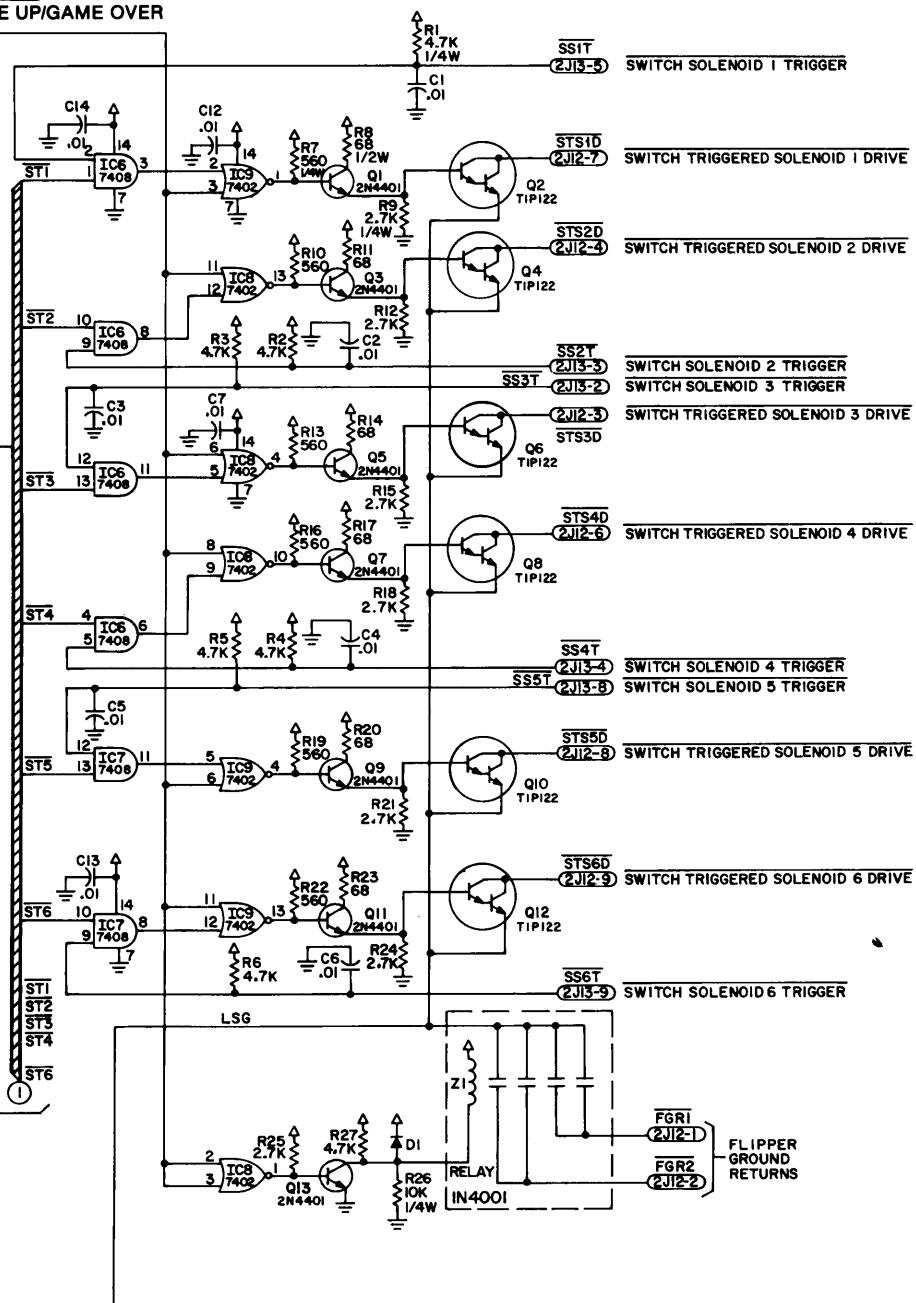


3
K

GAME UP/GAME OVER

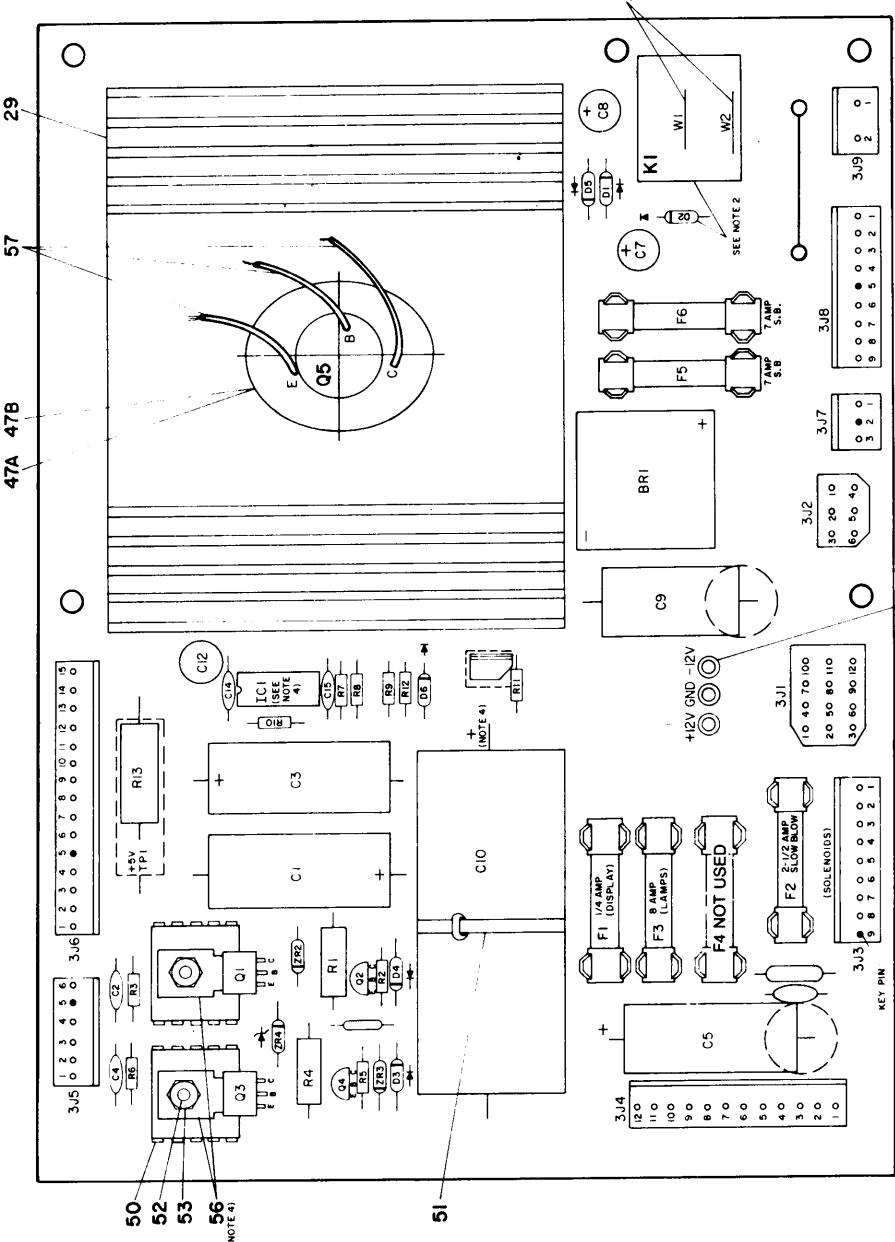


TO / FROM SHEET 1



BILL OF MATERIAL

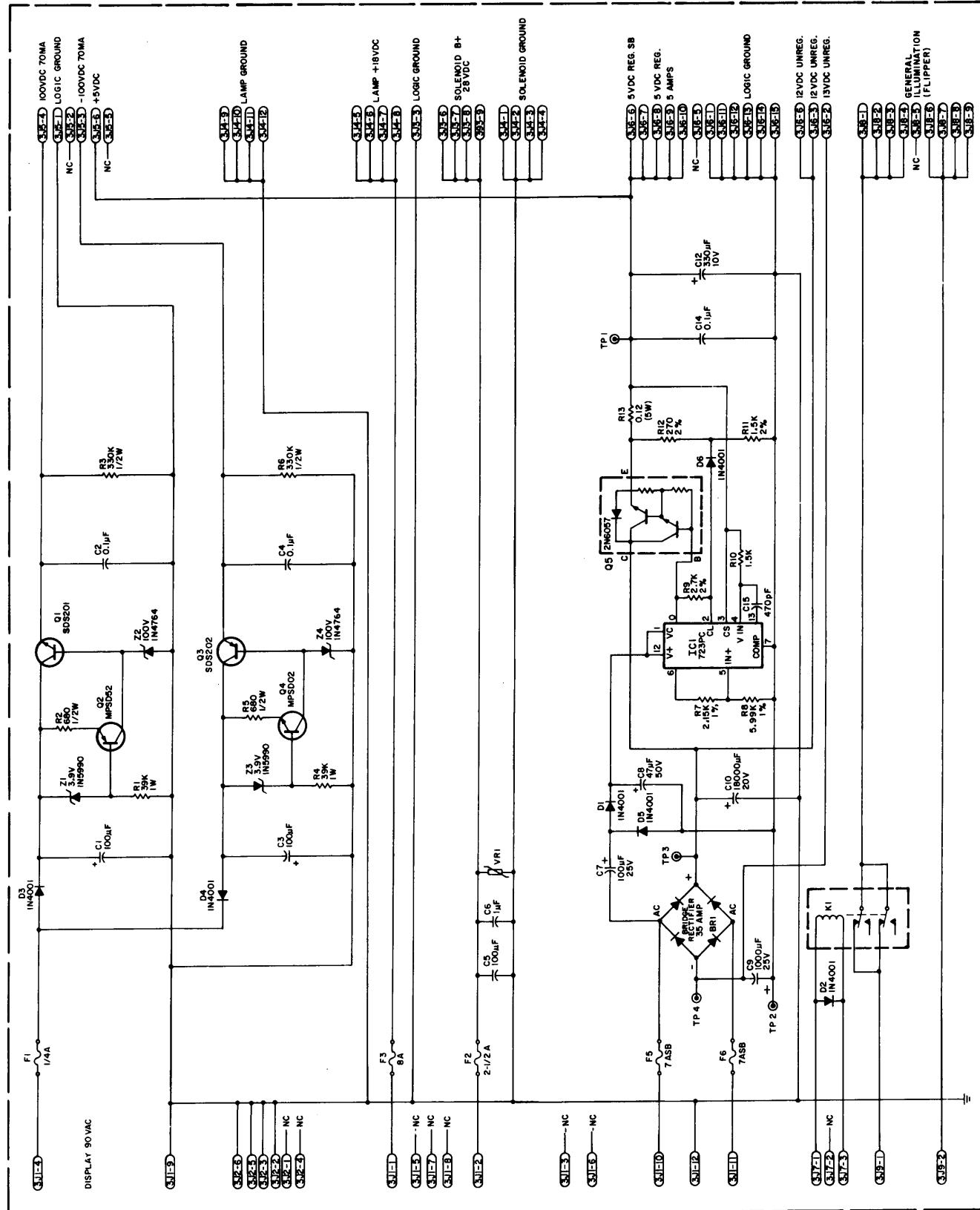
ITEM NO.	PART NO.	PART DESTINATION	DESCRIPTION	REQ'D NO.
1	575-09466	R7	BARE P.C. BOARD	1
2	5013-09426	R7	RESISTOR, 2.15K, 1%, 1/4 W, METAL FILM	1
3	5013-09427	R8	RESISTOR, 4.99K, 1%, 1/4 W, METAL FILM	1
4	5010-09428	R11	RESISTOR, 1.5K, 2%, 1/4 W, CARBON FILM	1
5	5010-09085	R10	RESISTOR, 2.7K, 2%, 1/4 W	1
6	5010-09541	R9	RESISTOR, 2.7K, 2%, 1/4 W	1
7	5010-09508	R12	RESISTOR, 250 OHM, 2% 1/4 W, CARBON FILM	1
8	5012-09429	R13	POWER RESISTOR, 0.12 OHM, 5%, 5W	1
9	5010-09536	R1, R4	RESISTOR, 39K, 5%, 1 W	2
10	5010-09061	R2, R5	RESISTOR, 680 OHM, 2 W	2
11	5010-09069	R3, R6	RESISTOR, 330K, 5%, 1/2 W	2
12	5040-09419	C10	CAP. ELECTROLYTIC, 18.000 MFD, 12V, AXIAL	1
13	5040-09420	C9	CAP. ELECTROLYTIC 1.000 MFD 12V, RADIAL OR AXIAL	1
14	5040-08893	C12	CAP. ELECTROLYTIC 330 MFD, 10V, RADIAL	1
15	5043-09065	C15	CAPACITOR, 470 PF, 100 MFD, ELECT., 150V	1
16	5040-09053	C1, C3	CAPACITOR, 100 MFD, ELECT., 100V, AXIAL OR RADIAL	1
17	5040-09070	C5	CAPACITOR, 0.1 MFD, 50V, DISC	1
18	5070-09446	C14	CAPACITOR, 0.1 MFD, 50V, DISC. 1 DIODE, IN4001	1
19	5070-06258	D1, D2, D3, D4, D5, D6	DIODE, IN4001	6
20	5075-09059	ZR1, ZR3	ZENER, IN9590, 3.9V, 1%	2
21	5075-09066	ZR2, ZR4	ZENER, IN4764, 100V, 5%	2
22	5066-09424	I1	VOLTAGE REGULATOR, MC1723 PC	1
23	504-09443	C2, C4, C6	CAPACITOR, 0.1 MFD, 200V, DISC	3
24	5040-09421	C7	CAPACITOR, 100 MFD, 25V, RADIAL	1
25	516-09057	Q1	TRANSISTOR, SDS 201 NPN	1
26	516-09056	Q4	TRANSISTOR, MPS D02 NPN	1
27	5194-09058	Q3	TRANSISTOR, SDS 102 PNP	1
28	5194-09055	Q2	TRANSISTOR, MPS D52 PNP	1
29	5705-0431		HEAT SINK	1
30	5791-09067	S15	CONNECTOR, 6 PIN (H)	1
31	5791-09074	S16	CONNECTOR, 15 PIN (H)	1
32	5791-09027	S18, S13	CONNECTOR, 6 PIN (H)	2
33	5791-09038	S12	CONNECTOR, 6 PIN (H)	1
34	5162-09425	Q5	TRANSISTOR, POWER, 2N6087 NPN	1
35	5791-09443	S14	CONNECTOR, 12 PIN (H)	1
36	5791-09435	S17	CONNECTOR, 3 PIN (H)	1
37	5791-09436	S19	CONNECTOR, 12 PIN (H)	1
38	5791-09068	S11	CONNECTOR, 12 PIN (H)	1
39	5732-08178	F1	FUSE HOLDER	14
40	5731-09118	F2	FUSE, 2-1/2 AMP, S.R.	1
41	5730-09071	F3	FUSE, 8 AMP	1
42		F4	NOT USED	1
43		F4	NOT USED	1
44	5731-08761	F1	FUSE, 20 AMP	1
45	5017-09061	VR1	VARISTOR	1
46	570-09445	47A	SOCKET	1
47	570-09530	47B	MICA INSULATOR	2
48	5820-09555	K1	RELAY, 24 VDC, 10 AMP, DPDT	1
49	5824-09248	K1	TERMINAL, #1502-1 (TEST POST)	3
50	5705-09042	BR-1	BRIDGE RECTIFIER, 35 AMP, 100V	1
51	34-7520-1		HEAT SINK	2
52	4005-01016-07		TIE WRAP	1
53	4405-01117		5-40 X 7/16 R.H. MECH. SCREW	2
54	5820-09555	W1, W2	5-40 HEX NUT	2
55	5040-09422	C8	JUMPER, 18 AWG	2
56	20-9229		CAPACITOR, 47 MFD, 50V, RADIAL	1
57	5731-09432		TERMAL COMPOUND	1
58			LEAD WIRE, #18 AWG (3")	3
			PULSE, 7A, S.B., 250V	2



NOTES:

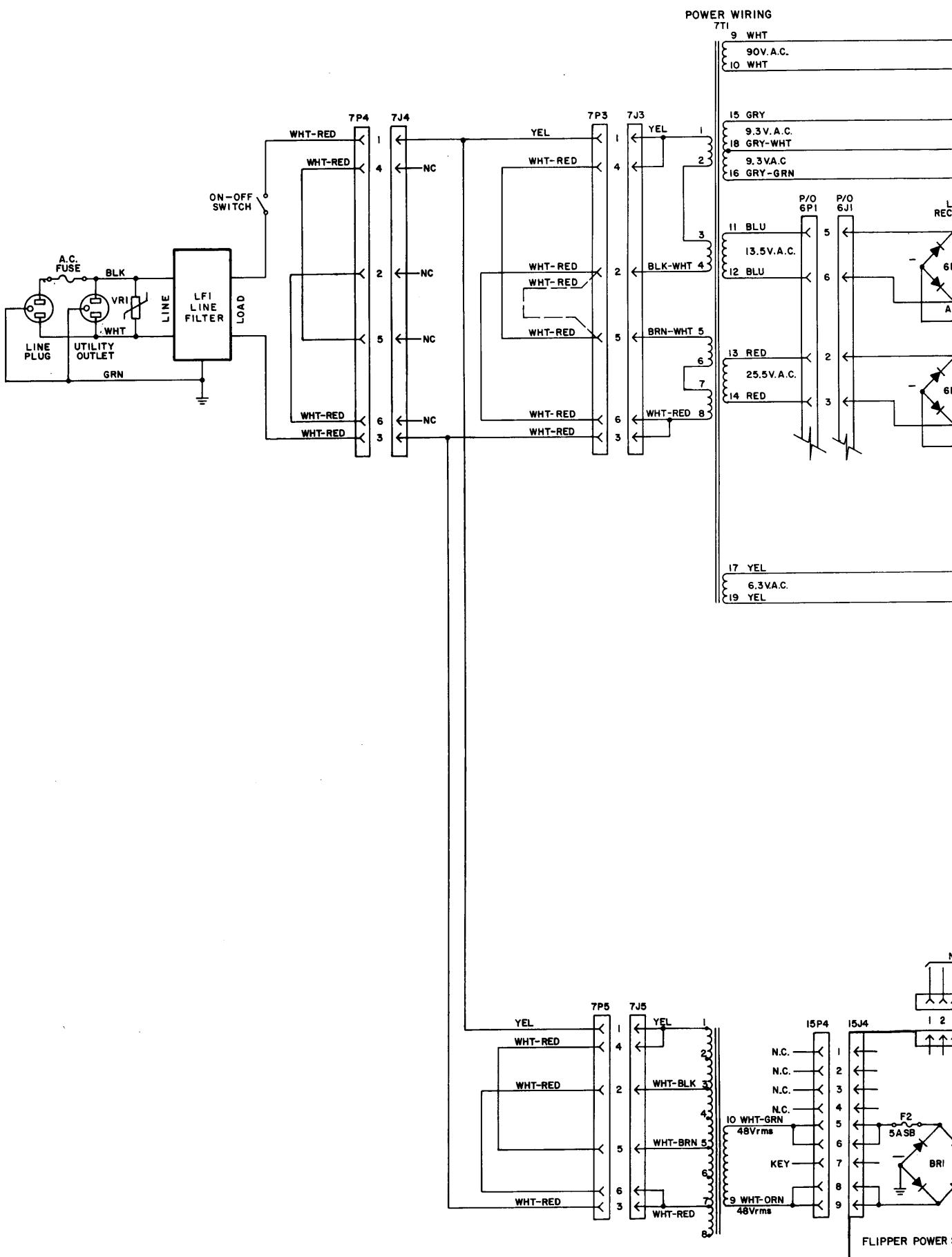
1. HEAT SINK COMPOUND MUST BE APPLIED BETWEEN TRANSISTOR AND HEAT SINK.
2. FOR BLACKOUT AND FUTURE GAME WITH SAME FEATURE REMOVE JUMPERS (W1 & W2).
3. OBSERVE INDEX MARK OF INTEGRATED CIRCUIT, POLARITY OF CAPACITORS, DIODE AND POSITION OF TRANSISTORS.
4. REFERENCE DWG'S: SCHEMATIC 16-8786.

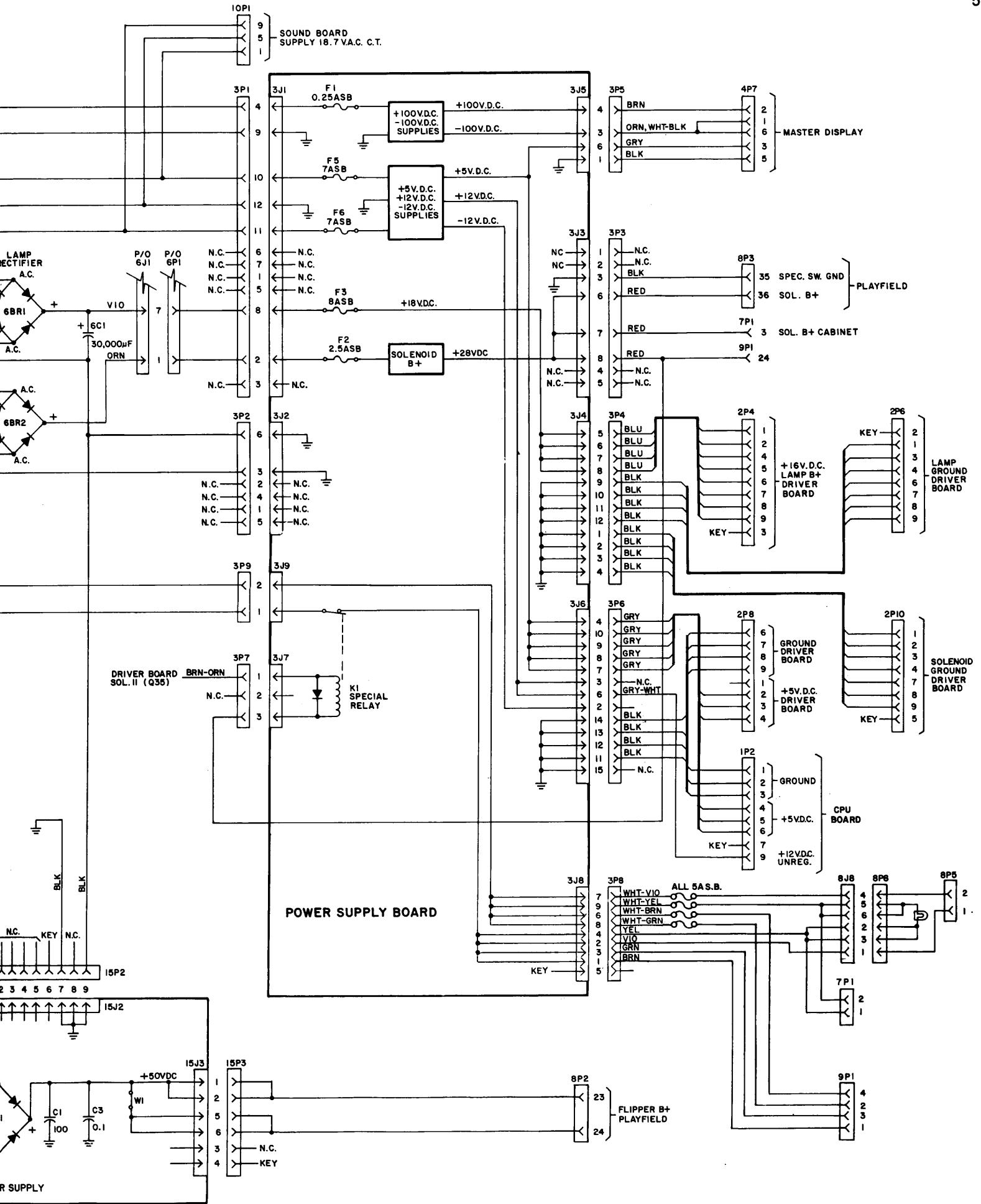
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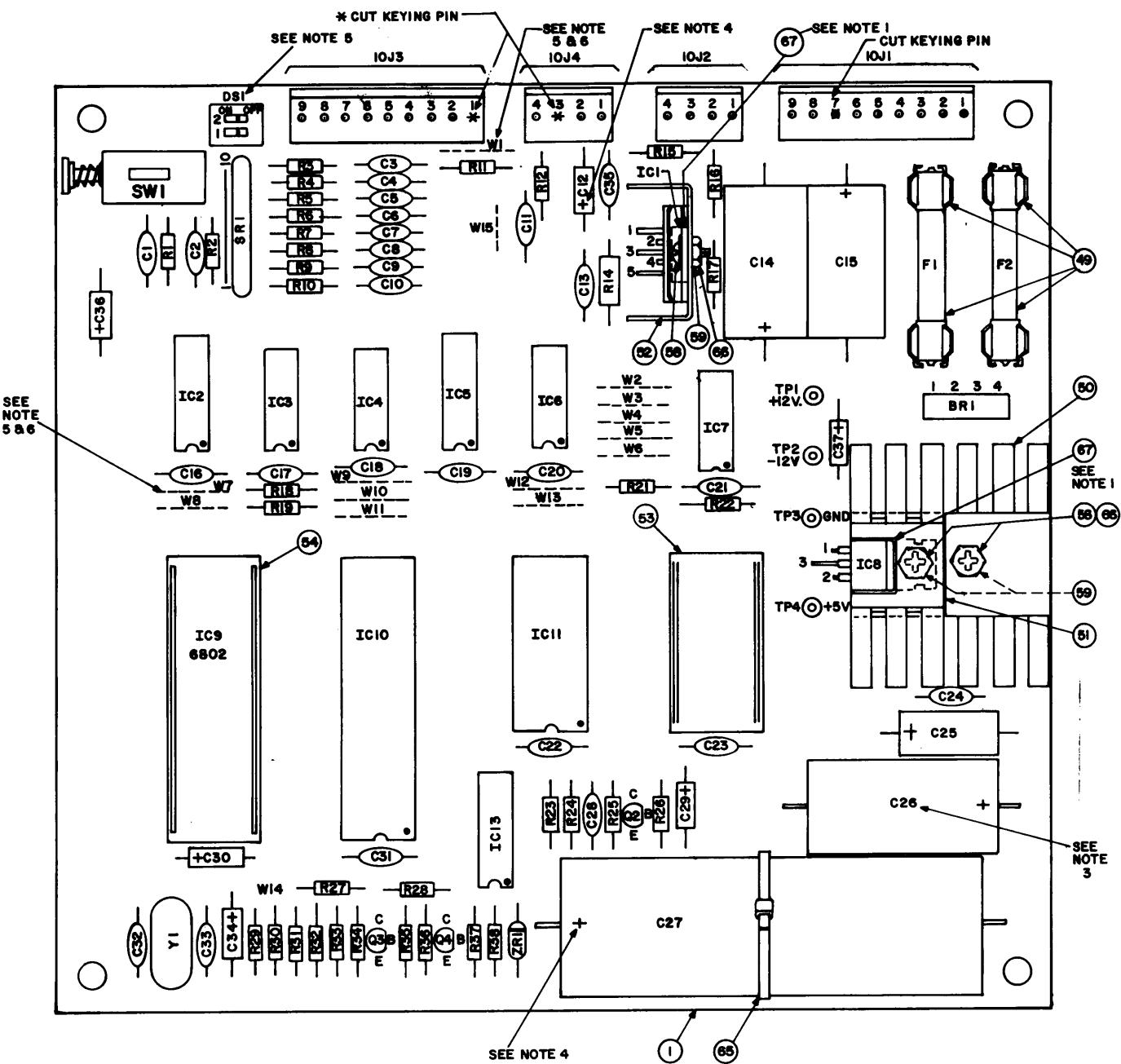


32

Power Supply Assembly and Schematic Diagrams







SOUND BOARD JUMPERS

JUMPERS USED	TOM TYPE	FORMAT	GAMES USED IN
W2, W5, W7, W9, W10, W15	2K x 8 2516, 2716	Sound & Speech	Gorgar, Blackout, Firepower, Black Knight, Jungle Lord, Pharaoh.
W1, W2, W5, W7, W9, W10, W15	2K x 8 2516, 2716	Sound Only	Defender Video & Pin, Solar Fire, Barracora, Hyperball, Stargate, Cosmic Gunfight, Varkon, Time Fantasy.
W3, W4, W5, W7, W10, W15	4K x 8 2532	Sound & Speech	Sinistar (Upright & Cockpit Front)
W1, W3, W4, W5, W7, W10, W15	4K x 8 2532	Sound Only	Robotron, Joust Video & Pin, Bubbles, Sinistar (Cockpit Rear)
W1, W2, W4, W5, W7, W10, W15	2K x 8 2516, 2716	Sound Only	Warlock
W1, W3, W6, W7, W9 W11, W12, W15	512 x 8 7641	Sound Only	Big Strike

BILL OF MATERIAL

ITEM NO.	PART NO.	PART DESIGNATION	DESCRIPTION	REQ'D. NO.
1	01-2 01-146-6		BARE P.C. BOARD REV F	1
2	5370-09156-00	IC1	TDA 2002 V AUDIO AMPLIFIER	1
3	5280-09012-00	IC2	7442 BCD-DEC DECODER	1
4	5280-09073-00	IC3	7400 QUAD 2 INPUT NAND	1
5	5280-08973	IC4	7408 QUAD 2 INP. AND GATE	1
6	5310-09153-00	IC5	4050 BUFFER	1
7	5310-09154-00	IC6	4068 8 INPUT NAND GATE	1
8	5310-08971-00	IC7	4069 HEX INVERTER	1
9	5250-09157-00	IC8	7805 5 VOLT REG. W/TO 220 CASE	1
10	5430-08972-00	IC10	6821 P.I.A.	1
11	5340-09003-00	IC11	6810 RAM	1
12	5371-09152-00	IC13	1408 D/A CONVERTER	1
13	5160-08938-00	Q2, Q3, Q4	2N4401 NPN TRANSISTOR	3
14				
15	5075-09018-00	ZR1	IN5996A 6.8V ZENER DIODE	1
16				
17	5100-09357-00)	BR1	MDA 200/3N253	1
	5100-09158-00)		BRIDGE RECTIFIER	0
18	5520-09020-00	Y1	3.58 MHz CRYSTAL	1
19	5010-08991-00	R1,R18,R19,R21,R22, R27,R30,R31,R32	RESISTOR, FC, 4.7K OHM, 5% 1/4 WATT	9
20	5010-09036-00	R2 thru R10	RESISTOR, FC, 100 OHM, 5% 1/4W	9
21	5010-09358-00	R12,R15,R28,R36,R38	RESISTOR, FC, 1K OHM, 5% 1/4W	5
22	5010-09181-00	R14	RESISTOR, FC, 1 OHM, 10% 1/2 WATT	1
23	5010-09161-00	R16	RESISTOR, FC, 2.2 OHM, 5% 1/4 WATT	1
24	5010-09361-00	R17	RESISTOR, FC, 220 OHM, 5% 1/2 WATT	1
25				
26	5010-08983-00	R23, R24, R26	RESISTOR, FC, 3.3K OHM, 5% 1/4 WATT	3
27	5010-09179-00	R25	RESISTOR, FC, 3.3M OHM, 5% 1/4 WATT	1
28	5010-09035-00	R29	RESISTOR, FC, 47K OHM, 5% 1/4 WATT	1
29	5010-09034-00	R33, R35, R37	RESISTOR, FC, 10K OHM, 5% 1/4 WATT	3
30	5010-09039-00	R34	RESISTOR, FC, 10 OHM, 5% 1/4 WATT	1
31	5043-08980-00	C1, C16 thru C23, C31	CAPACITOR, CER. .01 MFD. 50V. +80% -20%	10
32	5043-09065-00	C2 thru C10	CAPACITOR, CER. 470 PFD. 50V. +-20%	9
33	5043-09345-00	C11	CAPACITOR, CER. .001 MFD. +-20% 100V.	1
34	5040-09365-00	C12, C30, C36	CAPACITOR, ELECT. 1 MFD. 63V. -10 +50%	3
35	5043-08996-00	C13, C24, C35	CAPACITOR, CER. .1 MFD. 50V. +-20%	3
36	5040-09165-00	C14	CAPACITOR, ELECT. 1,000 MFD. 16V. +-20%	1
37	5040-09164-00	C15	CAPACITOR, ELECT. 470 MFD. 10V. +-20%	1
38	5040-08986-00	C25	CAPACITOR, ELECT. 100 MFD. 10V. +-20%	1
39	5040-08893-00	C26	CAPACITOR, ELECT. 1,000 MFD. 25V. +-20%	1
40	5040-09376-00	C27	CAPACITOR, ELECT. 4700 MFD. 16V. +-20%	1
41	5043-09180-00	C28	CAPACITOR, CER. 47 PFD. 1K V. +-20%	1
42	5040-09343-00)	C29	CAPACITOR, ELECT. 10 MFD. 20V	1
43	5043-09169-00	C32, C33	CAPACITOR, CER. DISC. 27 PFD. 1KV. +-10%	2
44	5041-09163-00	C34	CAPACITOR, TANTALUM 2.2 MFD. 15V. +-20%	1
45	5041-09031-00	C37	CAPACITOR, TANTALUM 1 MFD. 25V. +-20%	1
46	5641-09658-00)	SW1	MEMORY SWITCH SPDT	1
47	5645-09330-00	DS1	2 STD, DIP SWITCH	1
48	5731-06314-00	F1, F2	4 AMP SLOW BLOW FUSE	2
49	5732-09178-00		FUSEHOLDER	4
50	5705-09172-00		HEAT SINK THERMALLOY #6072B	1
51	5705-09173-00		HEAT SINK THERMALLOY #6071B	1
52	5705-09199-00		HEAT SINK THERMALLOY #6030	1
53	5700-09004-00		24 PIN SOCKET	1
54	5700-08985-00		40 PIN SOCKET	1
55	5791-09027-00	10J1, 10J3	9 PIN MALE CONNECTOR 09-65-1091	2
56	5791-09028-00	10J2, 10J4	4 PIN MALE CONNECTOR 09-65-1041	2
57				
58	4006-01003-06		6-32x3/8" P-PH-S	3
59	4406-01117-00		6-32 HEX NUT	3
60	5010-09534-00		0 OHM RESISTOR	A/R
61	5824-09248-00	TP1 THR TP4	TERMINAL #1502-1	4
62	5010-09363-00	R11	RESISTOR, FC, 5.6K OHM 5% 1/4 WATT	1
63				
64	5019-09362-00	SR1	RESISTOR, 4.7K OHM 10 PIN SIP	1
65	03-7520-1		TIE WRAP	1
66	4703-00007-00		#6 EXT. LOCKWASHER	3
67	20-9229		THERMAL COMPOUND	.01

NOTES:

1. USE THERMAL COMPOUND BETWEEN IC1 AND IC8, AND HEAT SINKS.

2. CAUTION: AVOID STATIC DISCHARGE DAMAGE TO MOS LOGIC.

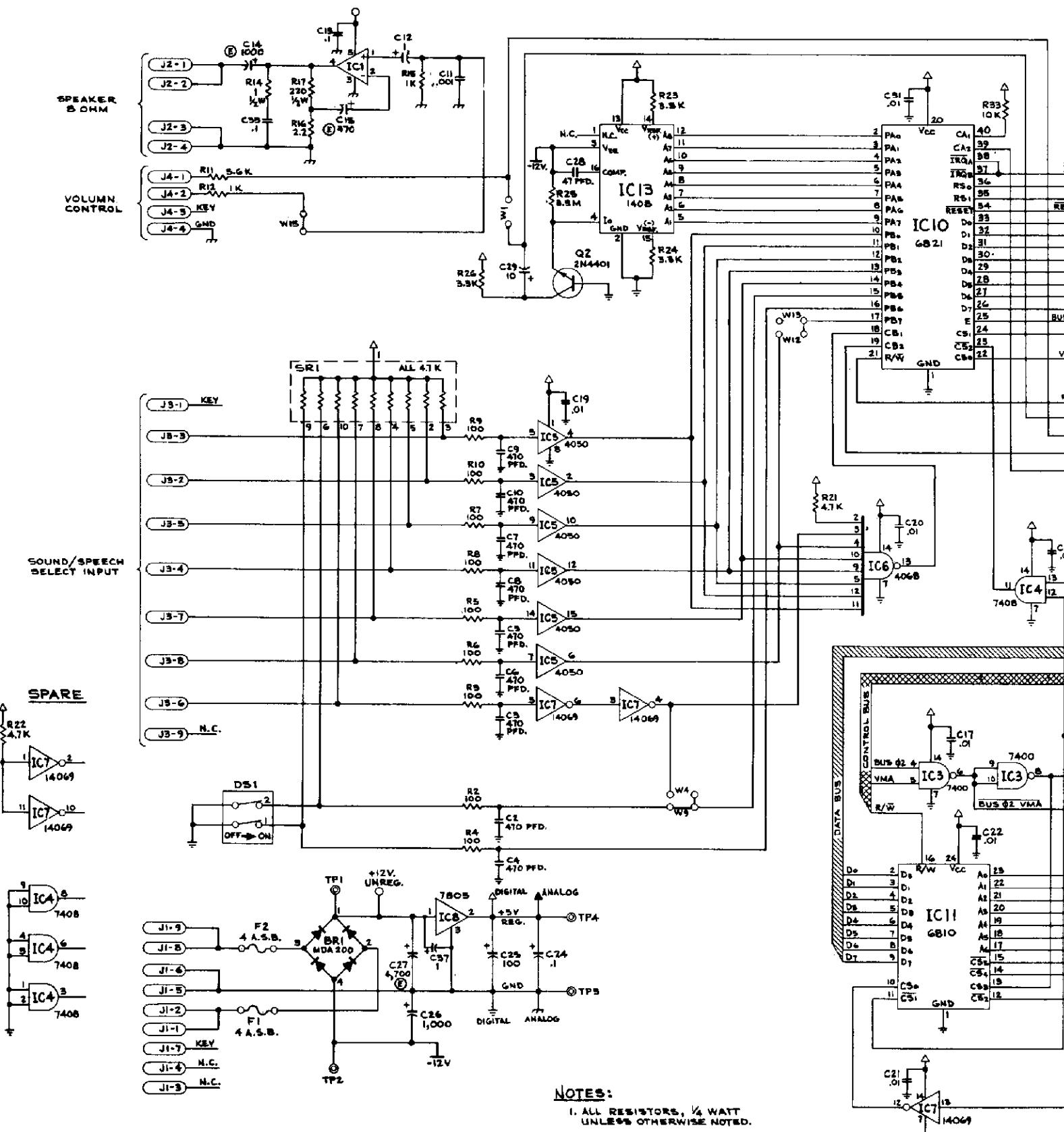
3. SYMBOLS SHOWN ON COMPONENTS ARE FOR REFERENCE ONLY.
DO NOT SCREEN OR STAMP.

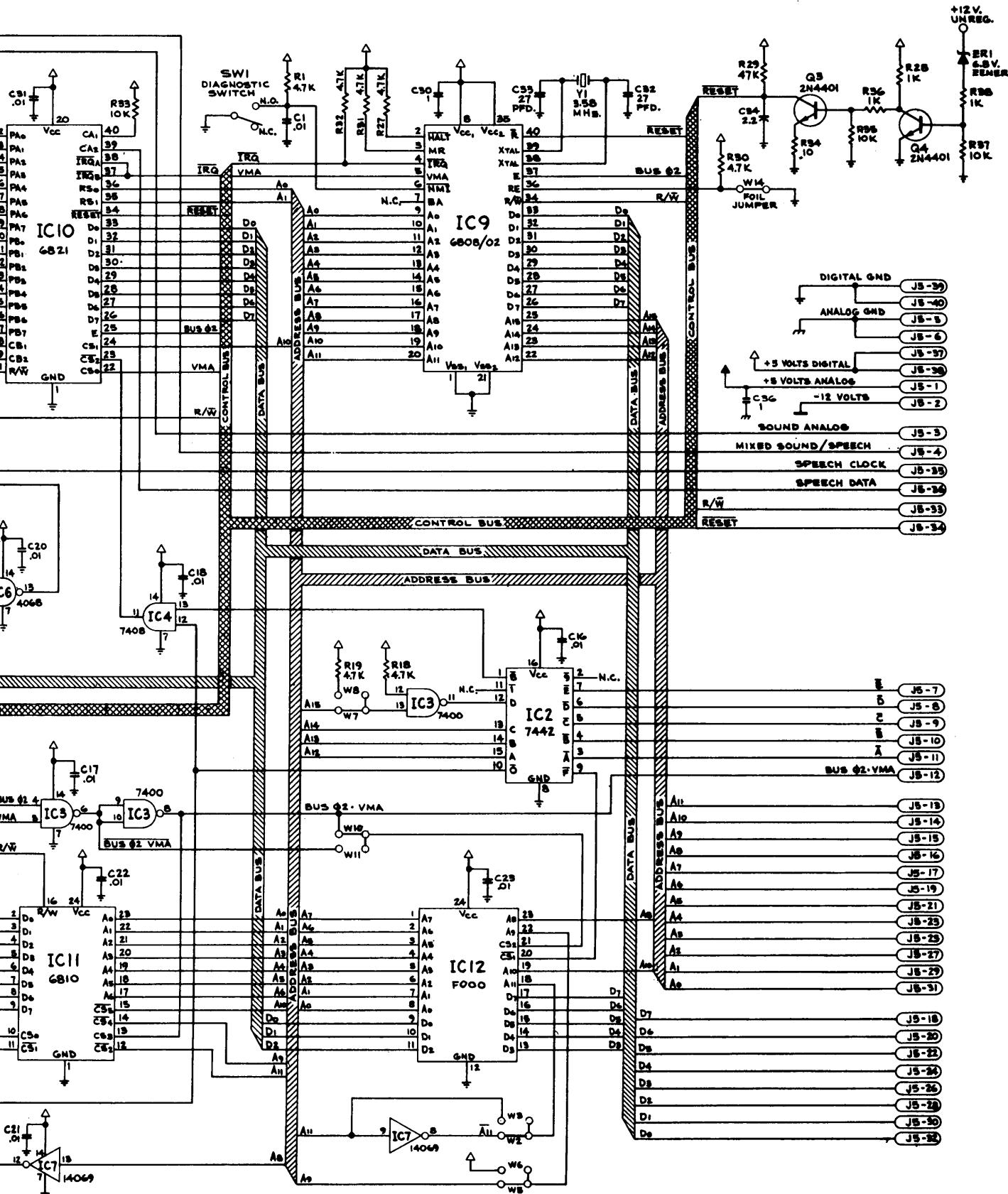
4. OBSERVE INDEX MARK OF ALL INTEGRATED CIRCUITS;

DIODES D1, D2, AND ZR1;

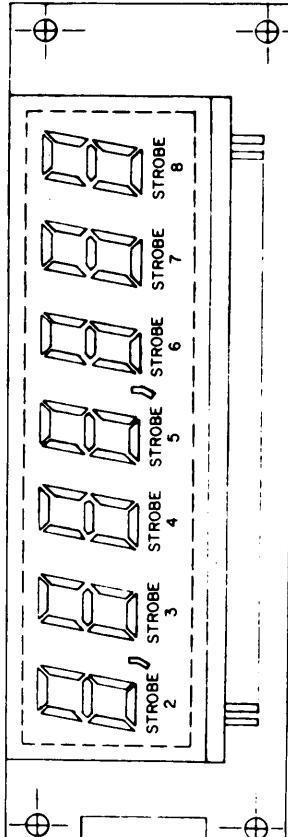
CAPACITORS C12, C14, C15, C25, C26, C27;

CONNECTORS 10J1, 10J2, 10J4, 10J3, 10J5;

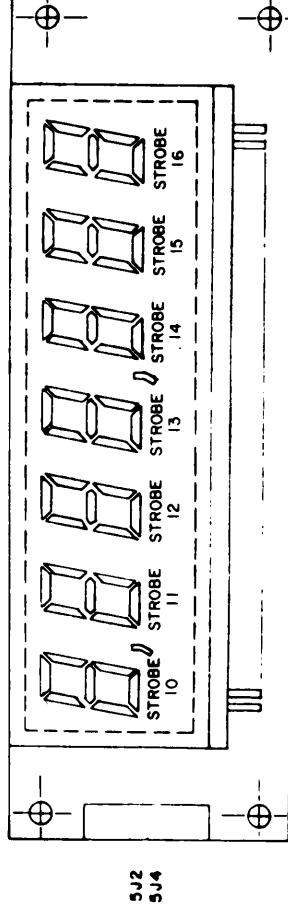




PLAYERS #1 AND 3



PLAYERS #2 AND 4



4J1/5J1 (PLAYER 1)

- 1 100,000's
- 2 -100V KEEP ALIVE
- 3 1,000,000's
- 4 f SEGMENT
- 5 N/C
- 6 9 SEGMENT
- 7 +100V (N/C)
- 8 e SEGMENT
- 9 10,000's
- 10 d SEGMENT
- 11 1,000's
- 12 +100V KEEP ALIVE
- 13 100's
- 14 COMMA
- 15 10's
- 16 c SEGMENT
- 17 N/C
- 18 b SEGMENT
- 19 UNITS
- 20 a SEGMENT

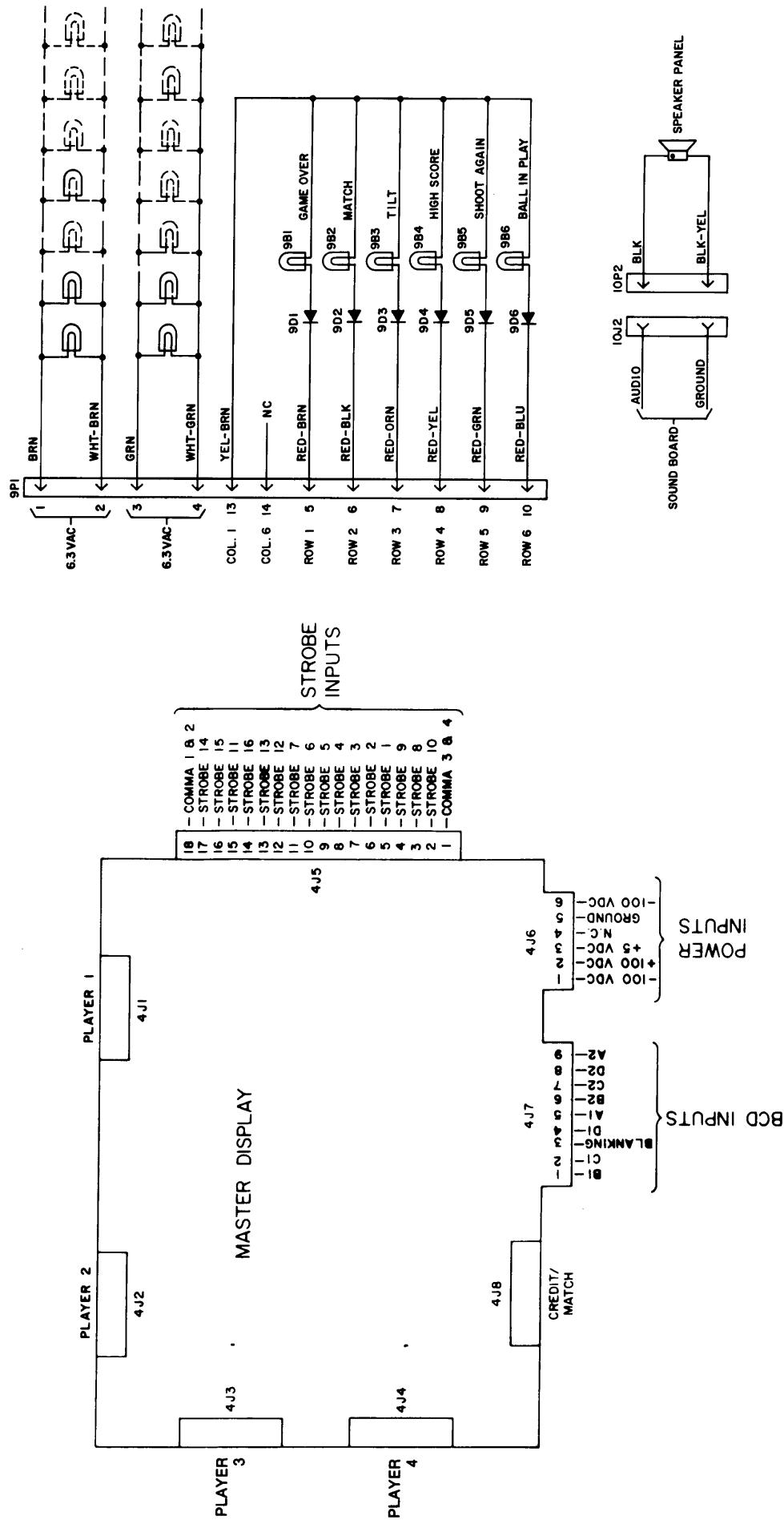
4J2/5J2 (PLAYER 2)

- 1 100,000's
- 2 -100V KEEP ALIVE
- 3 1,000,000's
- 4 f' SEGMENT
- 5 N/C
- 6 g' SEGMENT
- 7 +100V (N/C)
- 8 e' SEGMENT
- 9 10,000's
- 10 d' SEGMENT
- 11 1,000's
- 12 +100V KEEP ALIVE
- 13 100's
- 14 COMMA
- 15 10's
- 16 g' SEGMENT
- 17 N/C
- 18 b' SEGMENT
- 19 UNITS
- 20 a' SEGMENT

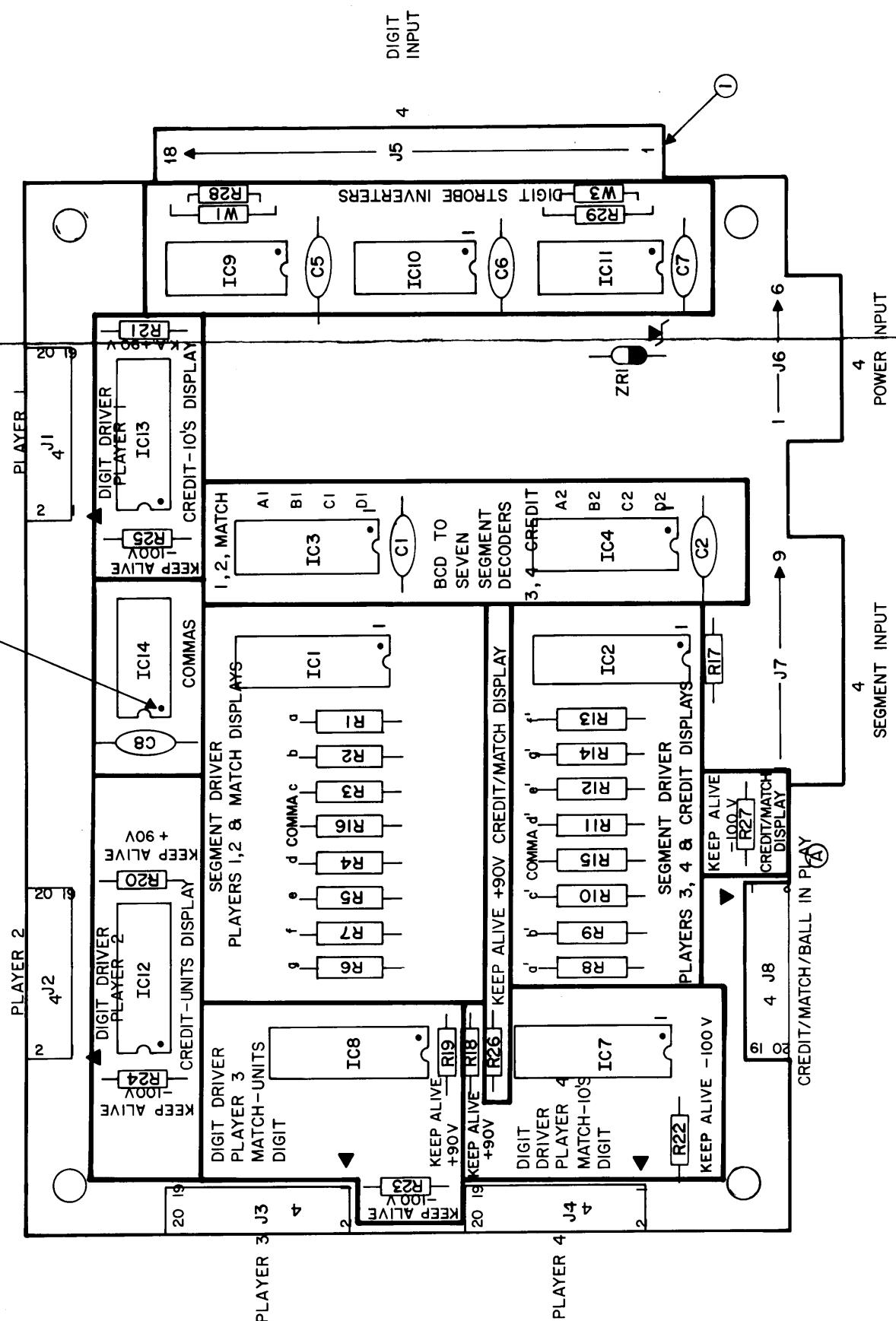
4J8/5J5 (CREDIT/MATCH)

- 1 f' Segment (Credit)
- 2 100V Keep Alive
- 3 e' Segment
- 4 g' Segment
- 5 c' Segment
- 6 d' Segment
- 7 b' Segment
- 8 10's
- 9 Units
- 10 a' Segment
- 11 e' Segment
- 12 f' Segment
- 13 10's
- 14 d' Segment
- 15 +100V Keep Alive
- 16 c' Segment
- 17 g' Segment
- 18 b' Segment
- 19 Units
- 20 a' Segment

PIN 1
RED LEAD
2



ALL IC'S WITH
DOT INDICATES
PIN NO. 1

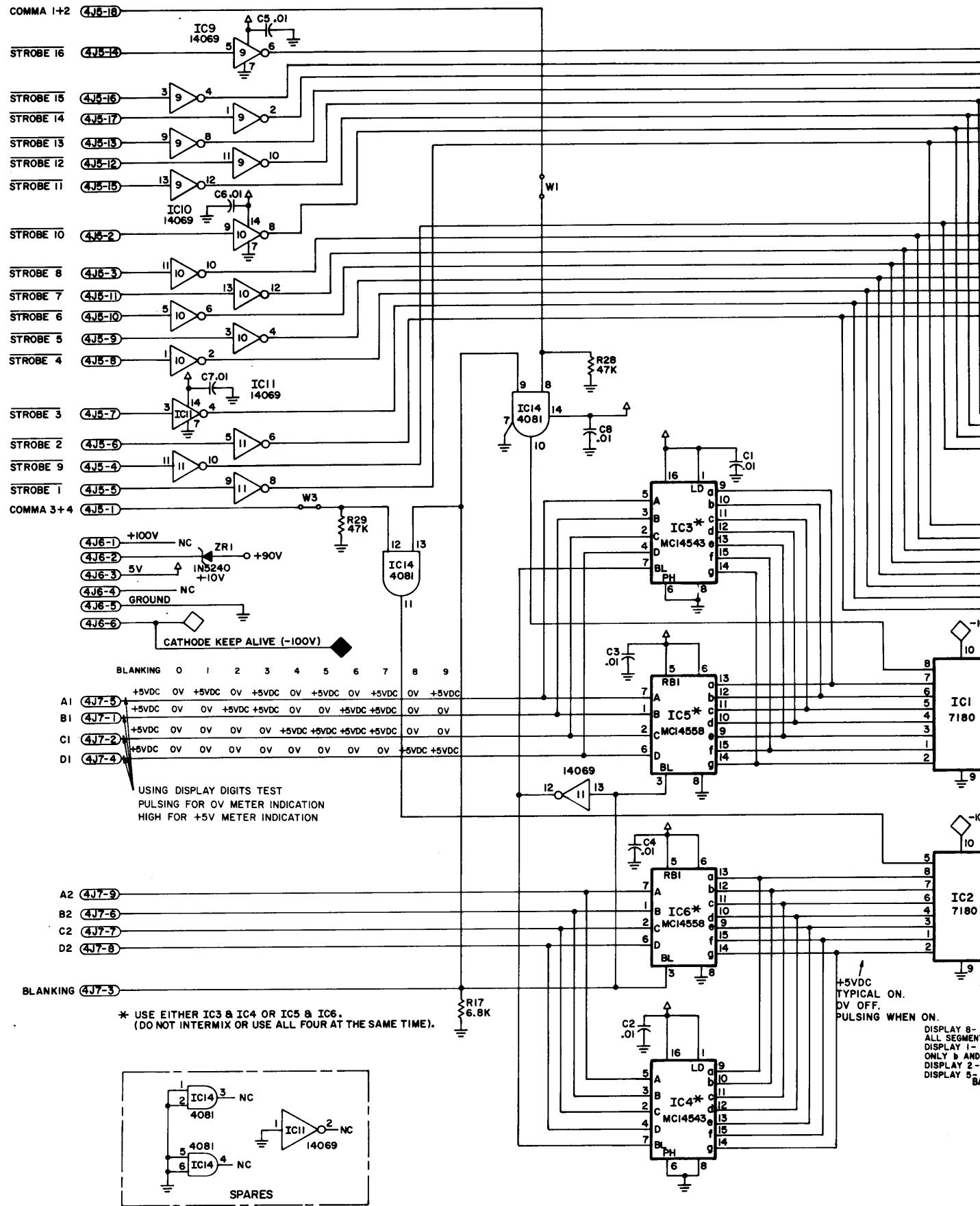


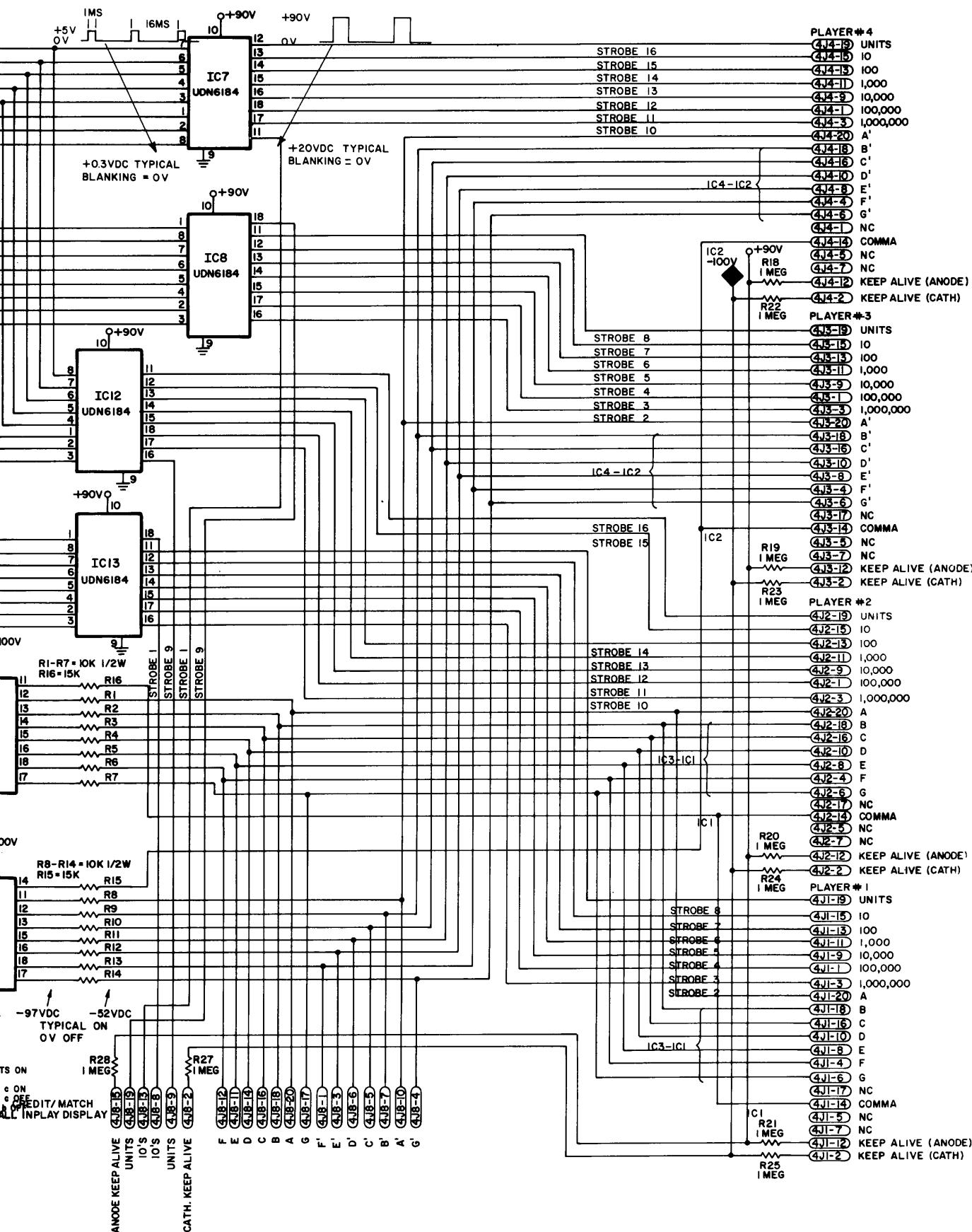
BILL OF MATERIAL

ITEM NO.	PART NO.	PART DESIGNATION	DESCRIPTION	REQ'D NO.
1	5760-09461		BARE P.C. BOARD	1
2	5310-08971	IC9, IC10, IC11	MC14069 HEX INVERTER	3
3	5310-08970	IC3, IC4	MC14543 BCD TO SEVEN SEGMENT LATCH/DECODER/DRIVER	2
4	5680-08969	IC1, IC2	UDN-7180 GAS DISCHARGE DISPLAY SEGMENT DRIVER	2
5	5680-08968	IC7, IC8, IC12, IC13	UDN-6184A OR UDN-6118A GAS DISCHARGE DISPLAY SEGMENT DR.	4
6	5310-09450	IC14	MC14081 QUAD 2-INPUT AND GATE	1
7	5010-08981	R1-R14	RESISTOR, FC, 10K OHM, 5%, 1/2 WATT	14
8	5075-09135	ZR1	IN4740A ZENER DIODE 10V, 5%, 1 WATT	1
9	5043-08980	C1, C2 C5 THRU C8	CAPACITOR, CERAMIC, 0.01 MFD., 50V, +80 -20%	6
10	5010-09035	R28, R29	RESISTOR, FC, 47K OHM, 5%, 1/4 WATT	2
11	5010-09086	R17	RESISTOR, FC, 6.8K OHM, 5%, 1/4 WATT	1
12	5010-08982	R18 THRU R27	RESISTOR, FC, 3 MEG. OHM, 5%, 1/4 WATT	10
13	5791-09437	J1 THRU J4, J8	20 PIN RIBBON HEADER	5
14	5010-09149	R15, R16	RESISTOR, FC, 15K OHM, 5%, 1/2 WATT	2
15	5010-09534	W1, W3	RESISTOR, O OHM	2

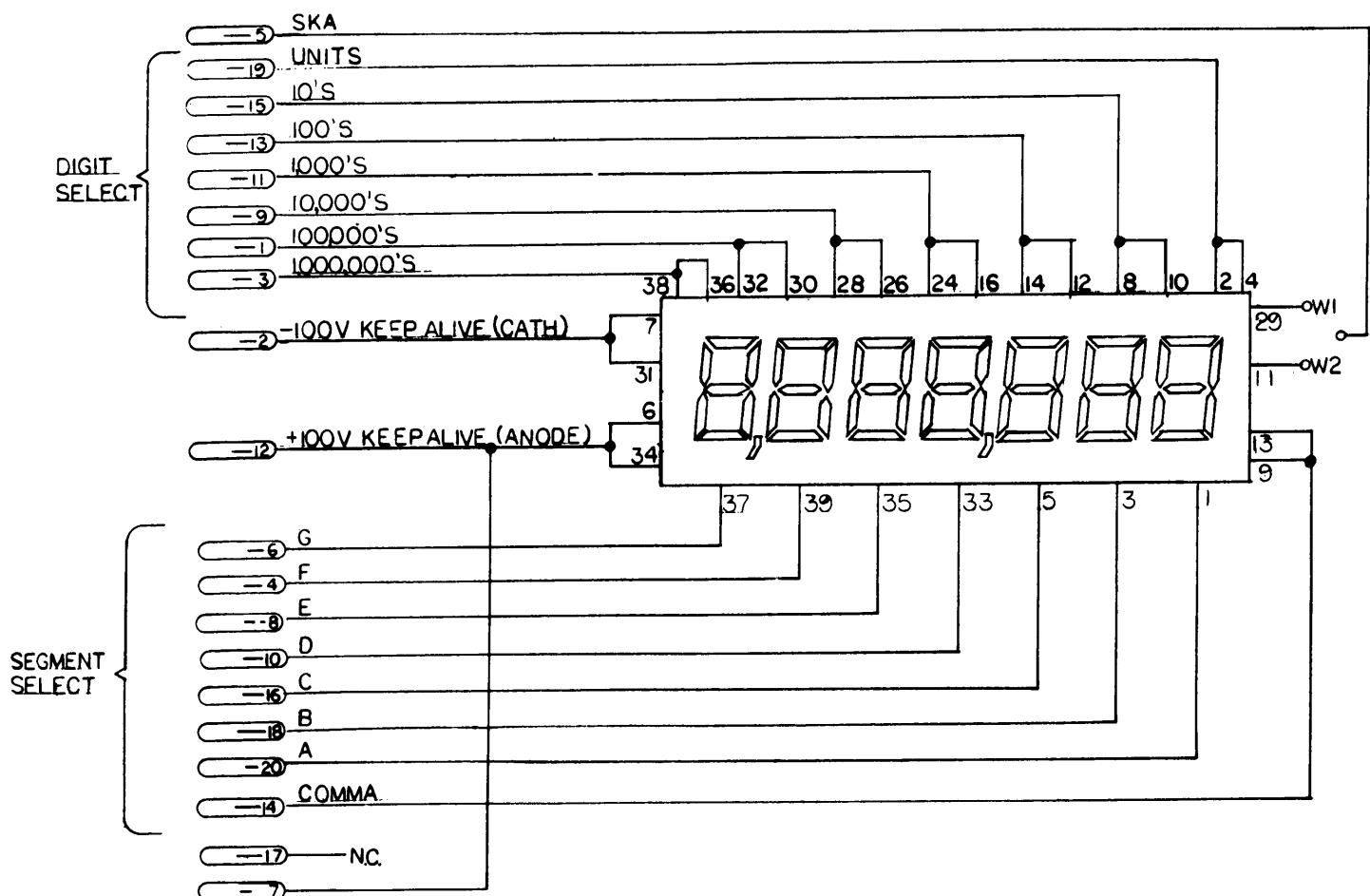
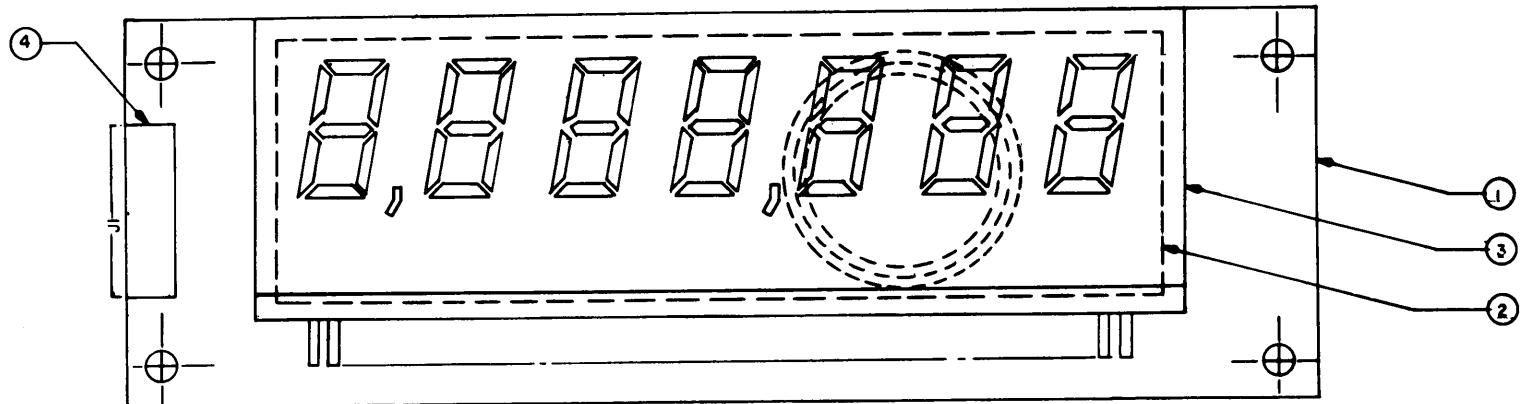
DIGIT CROSS REFERENCE

DIGIT	7-SEGMENT DECODER/DRIVER	STROBE (DRIVER)
Credit 10's	IC4/IC2	1 (IC13)
Credit Units	IC4/IC2	9 (IC12)
Match 10's	IC3/IC1	1 (IC7)
Match Units	IC3/IC1	9 (IC8)
#1 1,000,000	IC3/IC1	2 (IC13)
#1 100,000's	IC3/IC1	3 (IC13)
#1 10,000's	IC3/IC1	4 (IC13)
#1 1,000's	IC3/IC1	5 (IC13)
#1 100's	IC3/IC1	6 (IC13)
#1 10's	IC3/IC1	7 (IC13)
#1 Units	IC3/IC1	8 (IC13)
#2 1,000,000's	IC3/IC1	10 (IC12)
#2 100,000's	IC3/IC1	11 (IC12)
#2 10,000's	IC3/IC1	12 (IC12)
#2 1,000's	IC3/IC1	13 (IC12)
#2 100's	IC3/IC1	14 (IC12)
#2 10's	IC3/IC1	15 (IC12)
#2 Units	IC3/IC1	16 (IC12)
#3 1,000,000's	IC4/IC2	2 (IC8)
#3 100,000's	IC4/IC2	3 (IC8)
#3 10,000's	IC4/IC2	4 (IC8)
#3 1,000's	IC4/IC2	5 (IC8)
#3 100's	IC4/IC2	6 (IC8)
#3 10's	IC4/IC2	7 (IC8)
#3 Units	IC4/IC2	8 (IC8)
#4 1,000,000's	IC4/IC2	10 (IC7)
#4 100,000's	IC4/IC2	11 (IC7)
#4 10,000's	IC4/IC2	12 (IC7)
#4 1,000's	IC4/IC2	13 (IC7)
#4 100's	IC4/IC2	14 (IC7)
#4 10's	IC4/IC2	15 (IC7)
#4 Units	IC4/IC2	16 (IC7)
#1 Comma	-/IC1	2.5 (IC13)
#2 Comma	-/IC2	10,13 (IC12)
#3 Comma	-/IC1	2.5 (IC8)
#4 Comma	-/IC2	10,13 (IC7)



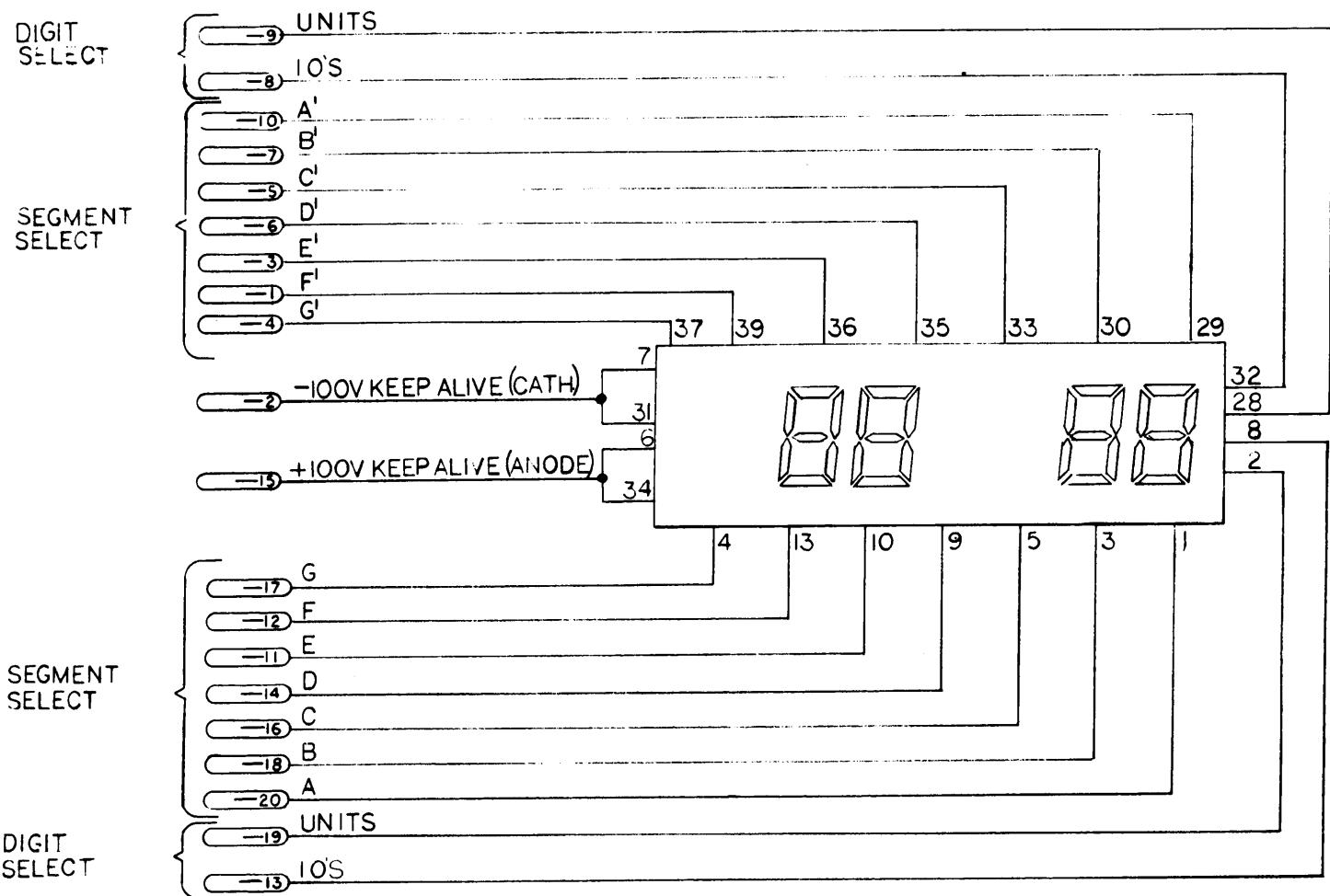
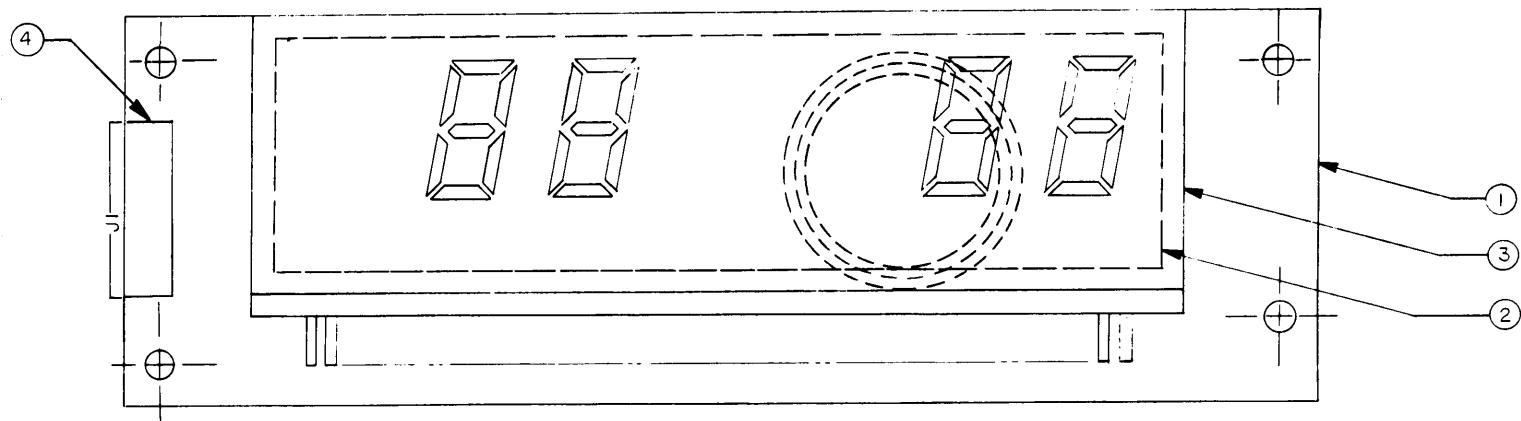


BILL OF MATERIAL				
ITEM	PART NO.	QTY. DESIGNATION	DESCRIPTION	REQ'D
1	ST61-08448-XP	1	SLAVE DISPLAY P.C. BOARD	1
2	U3-6648	1	DISPLAY MTG ADHESIVE FOAM	1
3	8670-08430-XP	1	7 DIGIT DISPLAY	1
4	ST81-08418-XP	J1	20 PIN RIBBON HEADER	1
5	OS-7873-2		CAPPLUG	1

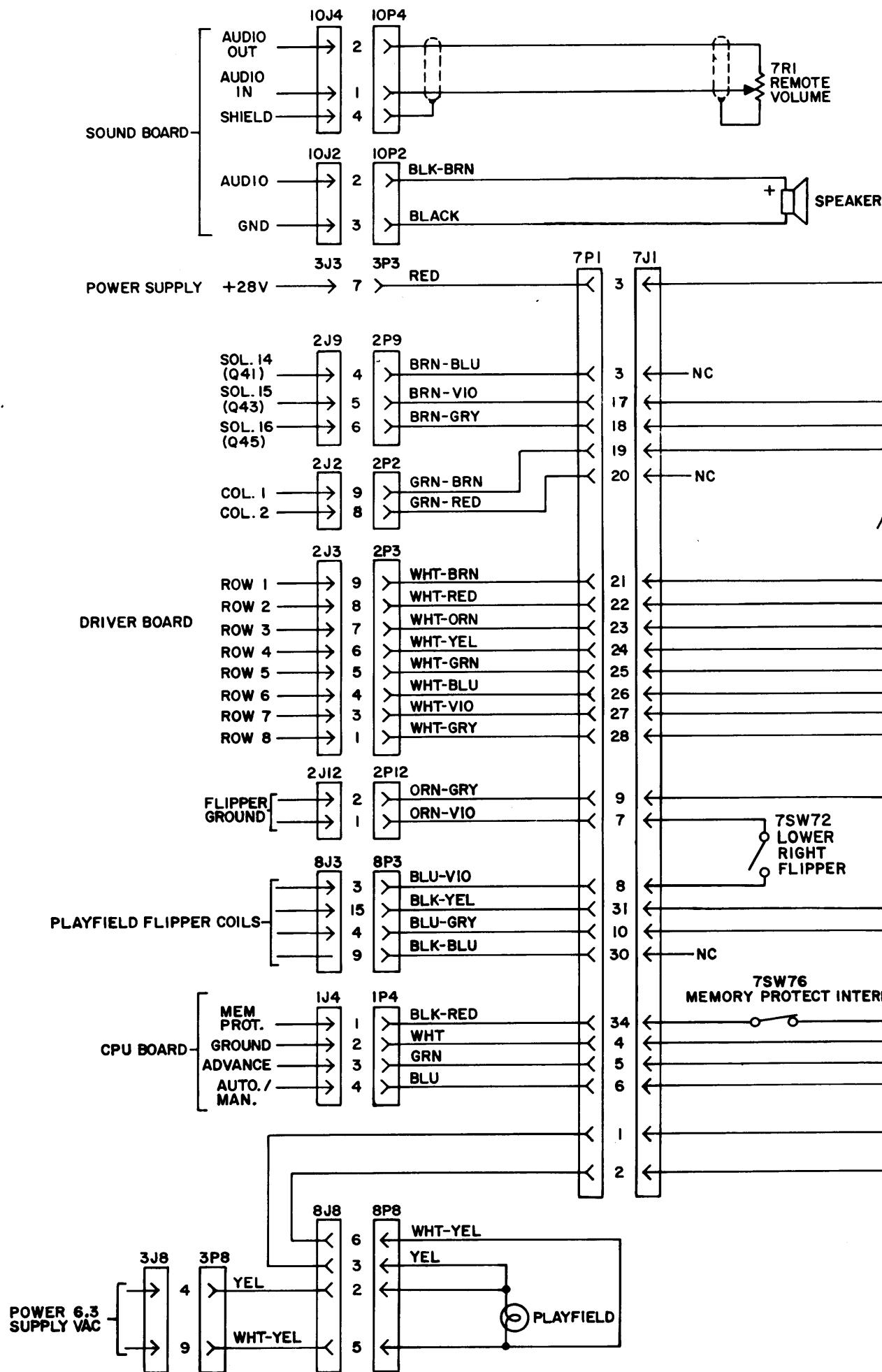


C 8364 PLAYER SLAVE DISPLAY

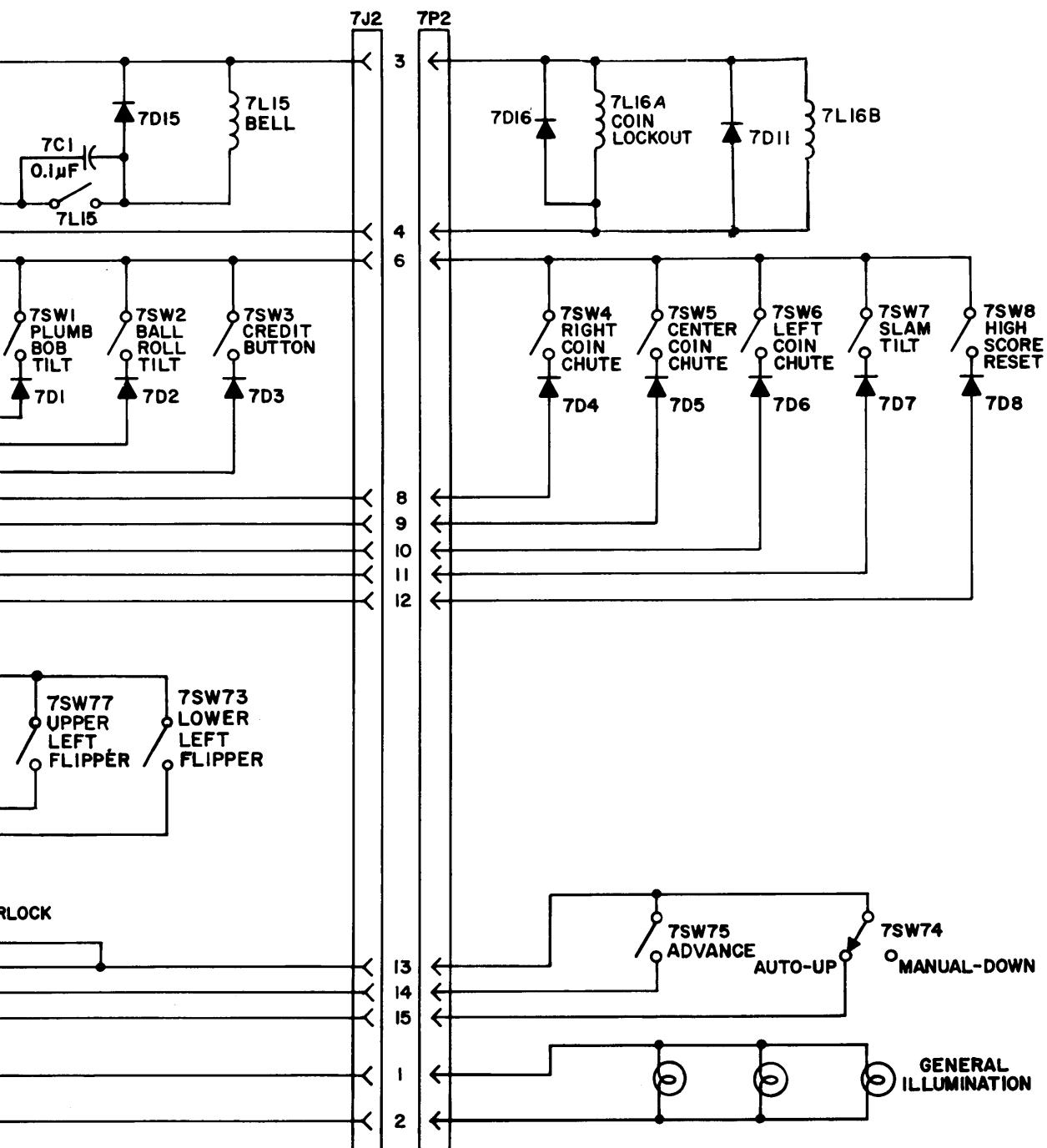
BILL OF MATERIAL				
ITEM	PART NO.	PART DESIGNATION	DESCRIPTION	REQ'D
1	516705946B-00		CREDIT/MATCH SLAVE P.C. BOARD	1
2	23-6545-		FOAM DISPLAY - BACK	1
3	5670-05946B-00		4 DIGIT DISPLAY	1
4	5791-05946B-00	J1	20 PIN RIBBON HEADER	1
5	23-6546		FOAM DISPLAY - FRONT	1
6	03-1573-2		CAPPLUG	1

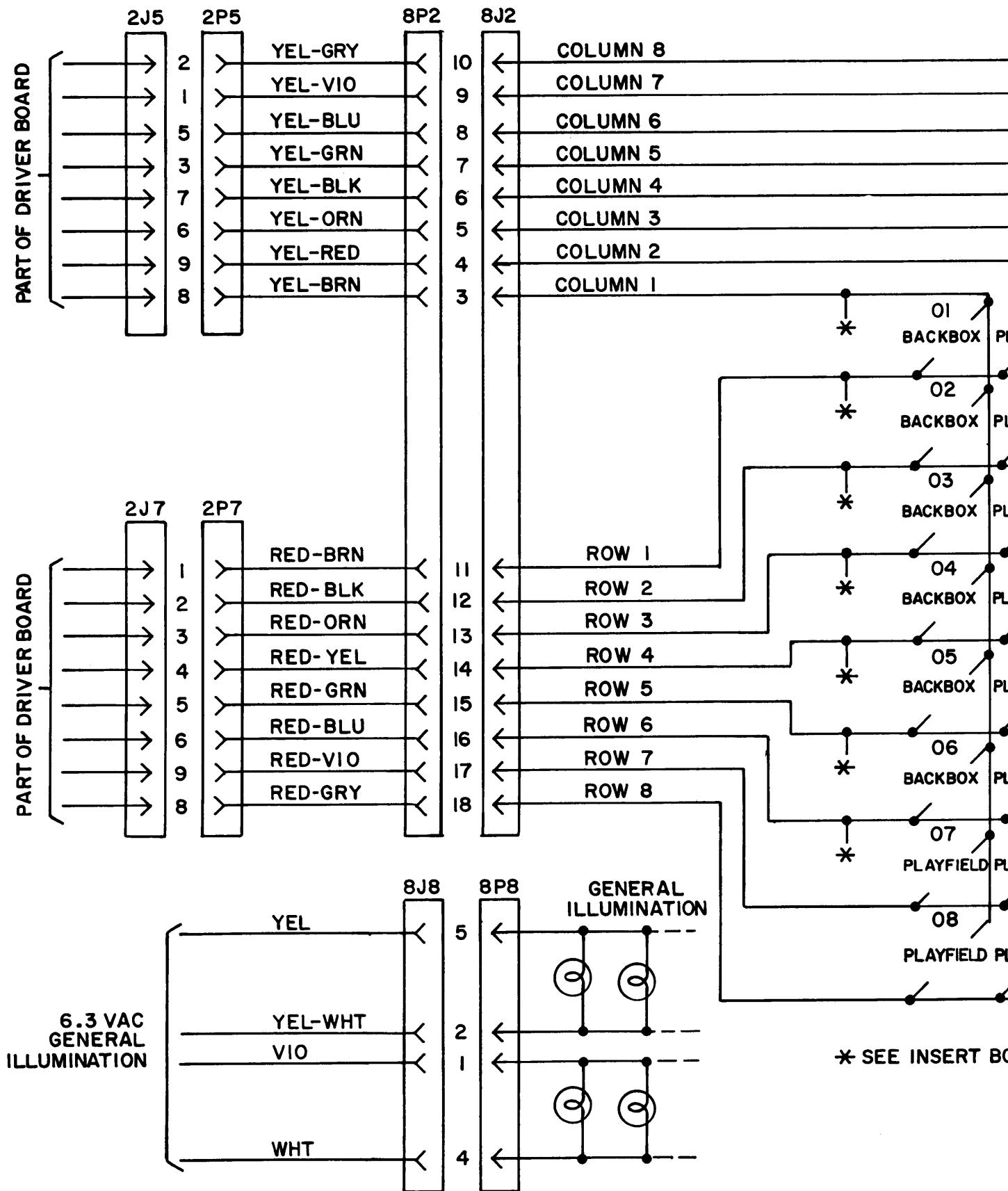


C 8365 CREDIT/MATCH SLAVE DISPLAY

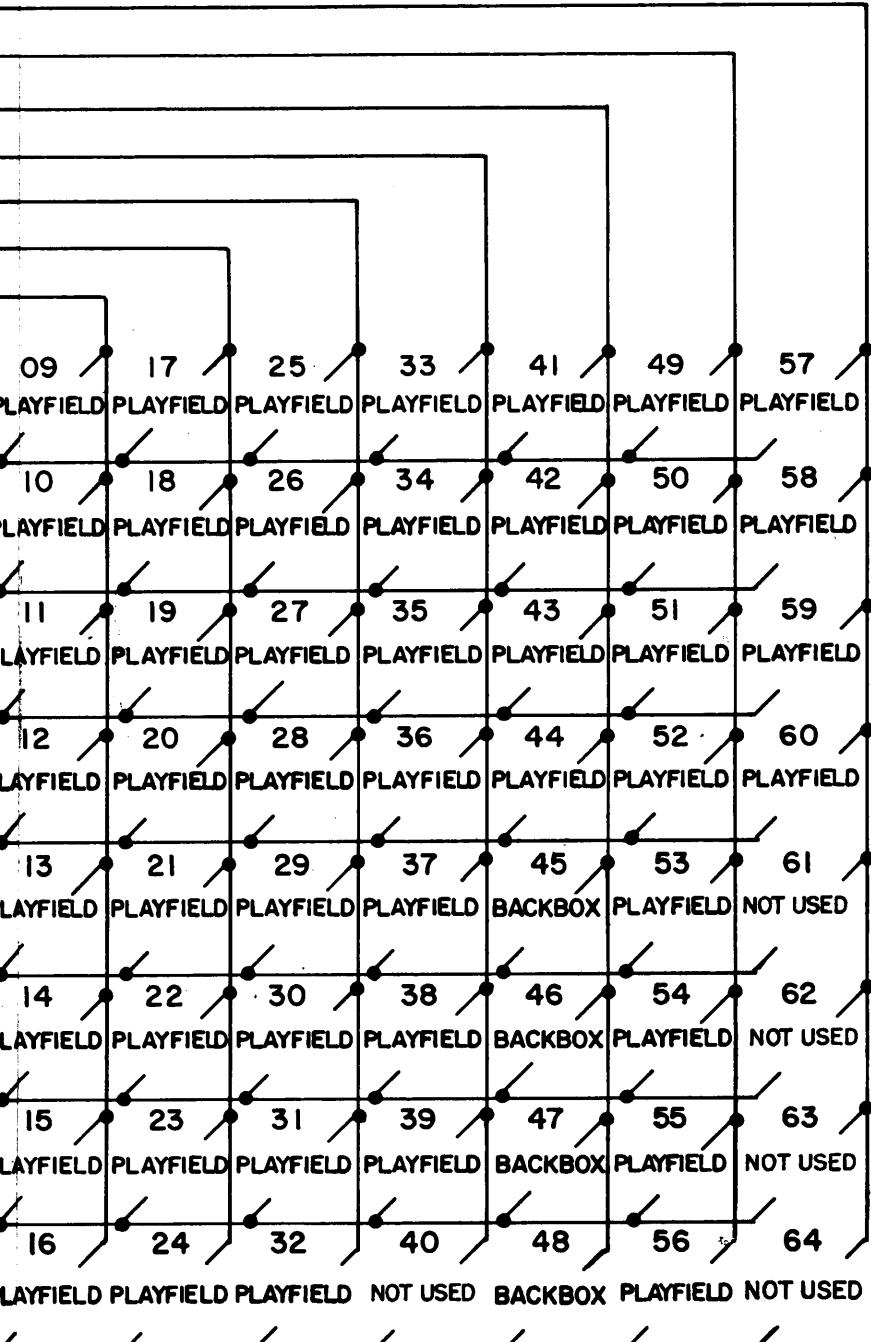
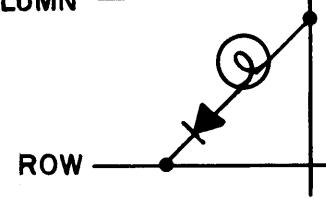


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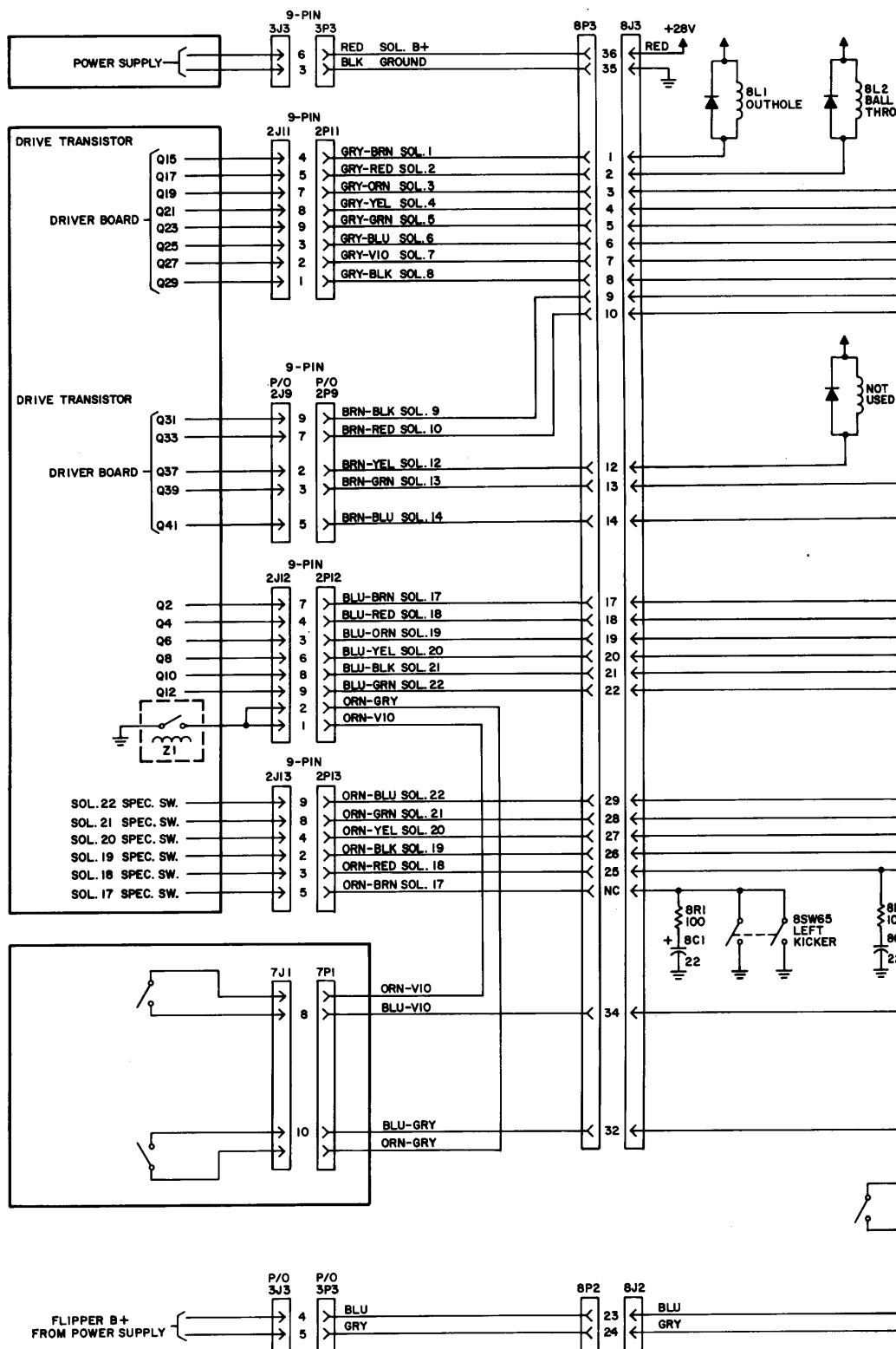


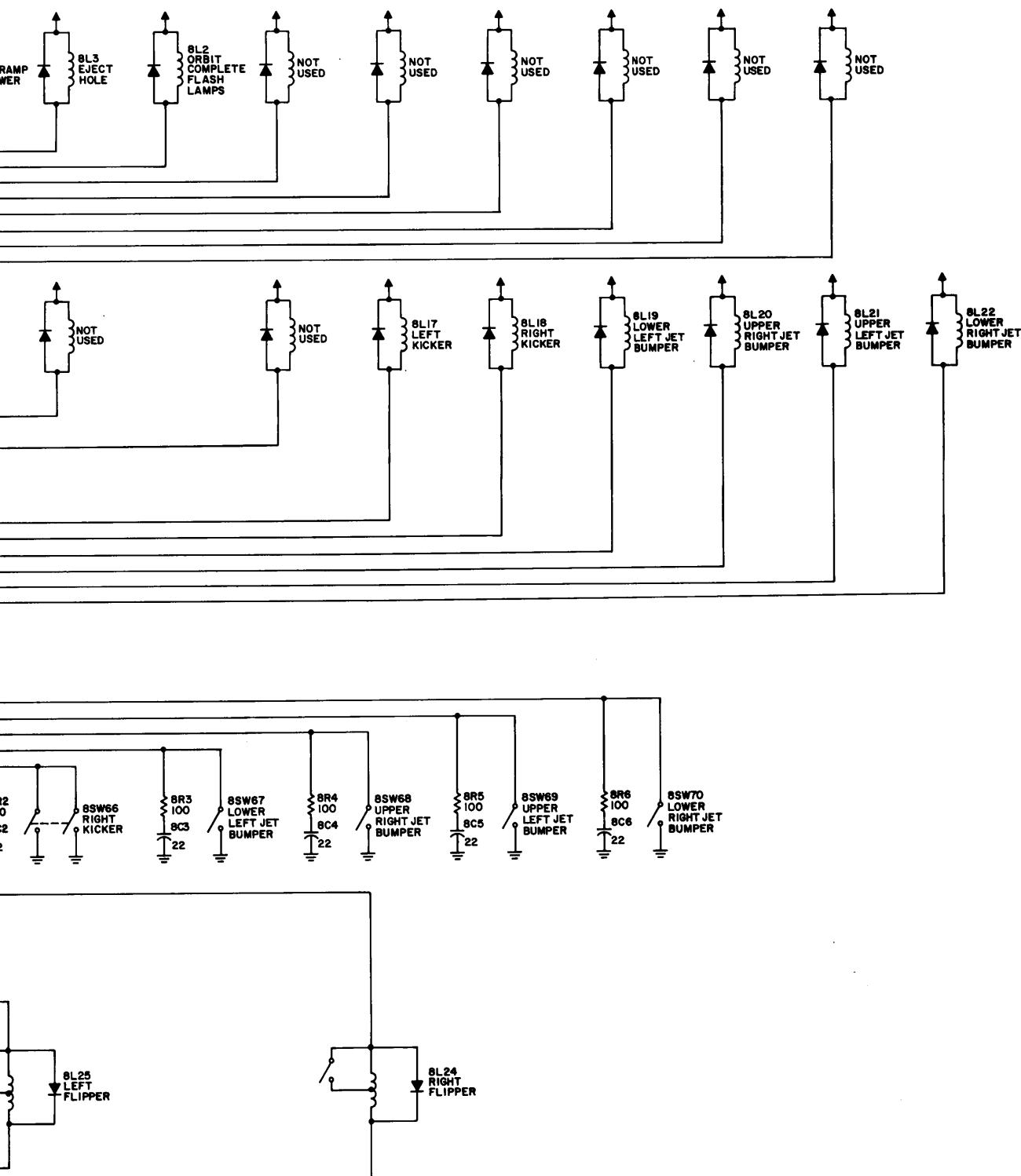
TYPICAL
LUMN

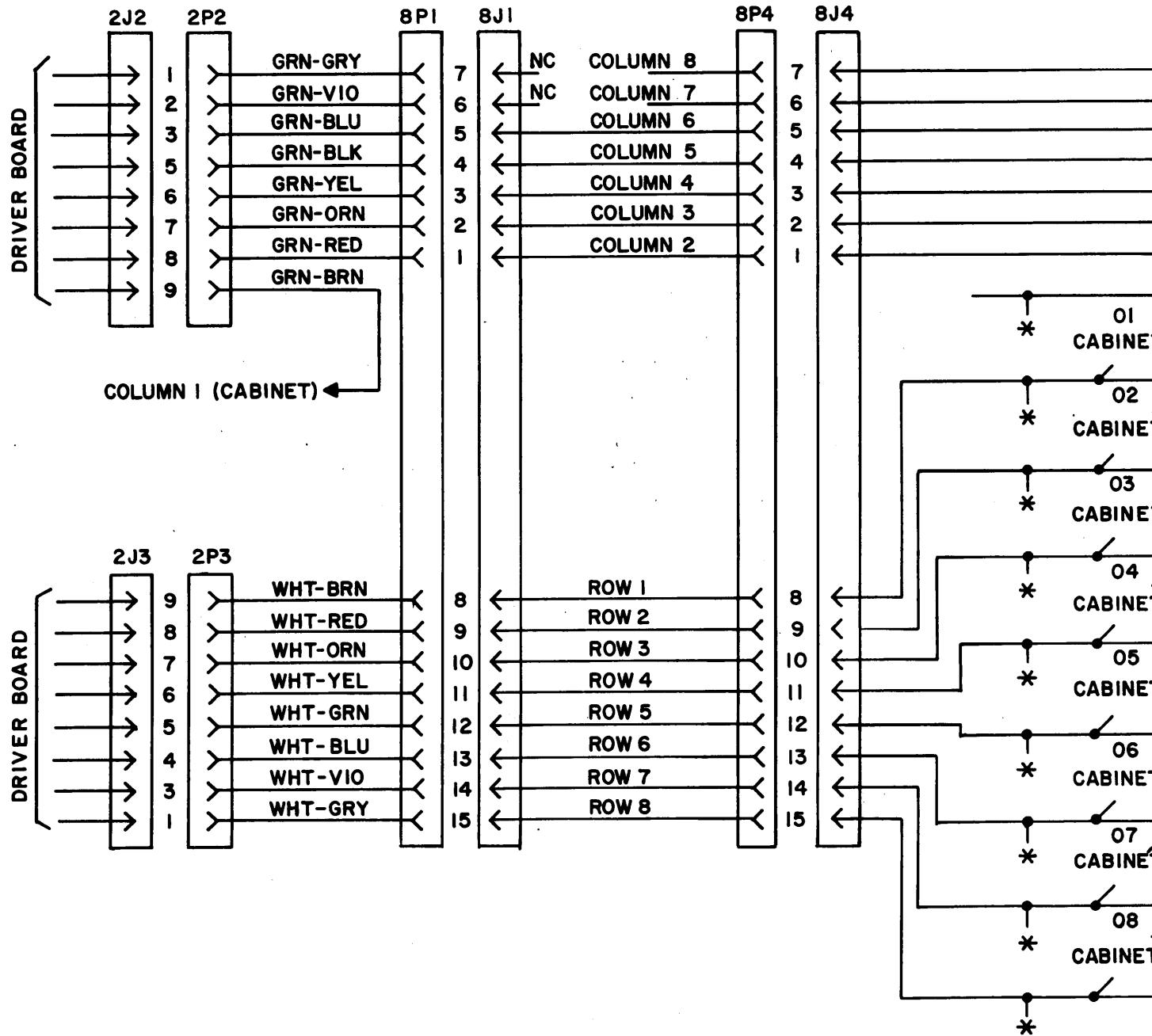


Lamp No.	Function
1	Game Over
2	Match
3	Tilt
4	High Score
5	Shoot Again
6	Shoot Again
7	Double Score
8	Bonus Holdover
9	1,000 Bonus
10	2,000 Bonus
11	3,000 Bonus
12	4,000 Bonus
13	5,000 Bonus
14	6,000 Bonus
15	7,000 Bonus
16	8,000 Bonus
17	9,000 Bonus
18	10,000 Bonus
19	20,000 Bonus
20	40,000 Bonus
21	60,000 Bonus
22	80,000 Bonus
23	Bonus Holdover
24	Fire Power Special
25	"F"
26	"I"
27	"R"
28	"E"
29	"P"
30	"O"
31	"W"
32	"E"
33	"R"
34	"A"
35	"B"
36	"C"
37	"D"
38	Left Drain Special
39	Right Drain Special
40	Ball In Play
41	Lower Left Jet Bumper
42	Upper Right Jet Bumper
43	Upper Left Jet Bumper
44	Lower Right Jet Bumper
45	Left Flipper Return Lane
46	Right Flipper Return Lane
47	Mystery
48	Extra Ball
49	2x
50	3x
51	5x
52	Eject Hole 10K
53	Eject Hole 20K
54	Eject Hole 50K
55	Eject Hole Lock Arrow
56	Release Target 50K
57	Release Target 100K
58	Release Target 150K
59	Release Arrow
60	Spinner
61	Not Used
62	Not Used
63	Not Used
64	Not Used

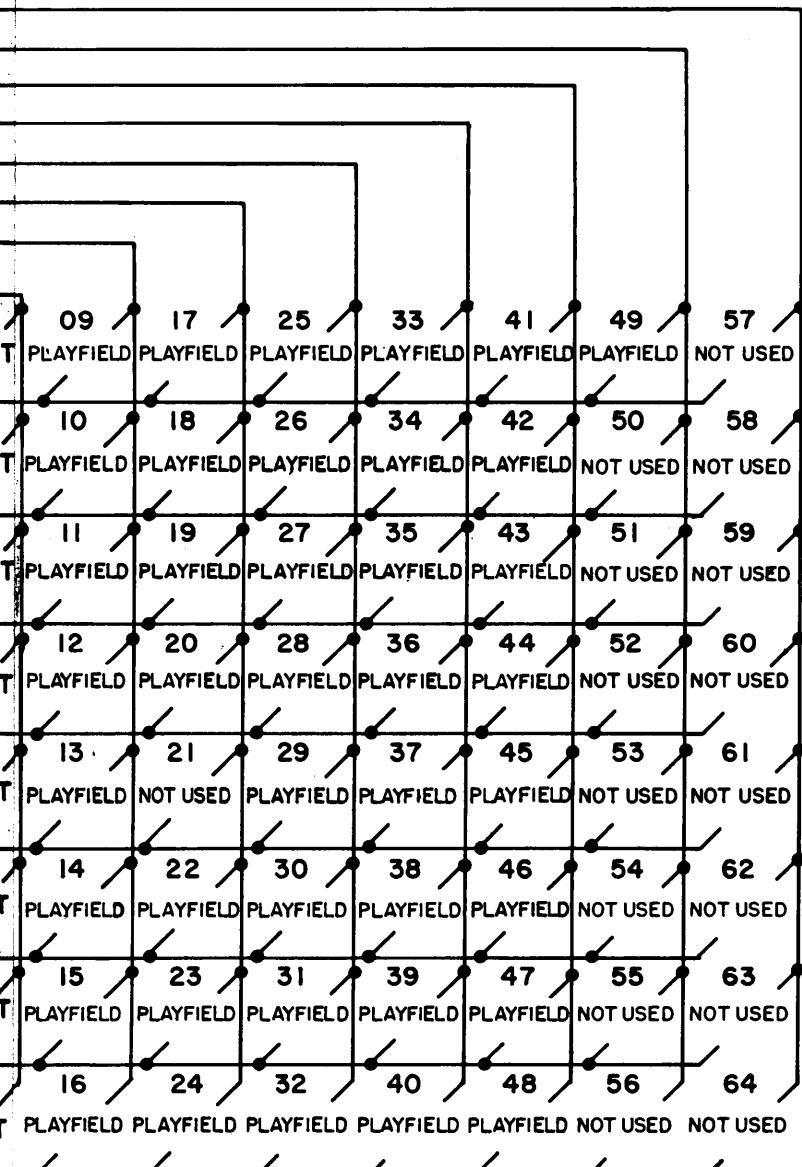
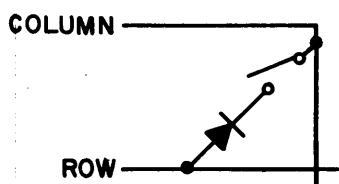
STANDARD WIRING DIAGRAM FOR CONNECTIONS FOR BACKBOX LAMPS.







TYPICAL



Switch No.	Function	(Score)
1	Plumb Tilt	
2	Ball Roll Tilt	
3	Credit Button	
4	Right Coin	
5	Center Coin	
6	Left Coin	
7	Slam Tilt	
8	High Score Reset	
9	Outhole	
10	Right Ball Ramp	
11	Left Ball Ramp	
12	Ball Shooter Trough	
13	Lane Change	
14	Ramp in Roll Under	
15	Ramp out Roll Under	
16	Center Left Standup	
17	Standup	
18	Spinner	
19	Orbit in Roll Under	
20	Upper Left Standup	(50)
21	Not Used	
22	Upper Right Standup	(50)
23	Eject Hole	(5000/Lit Value)
24	Released Target	(1000)
25	"F" Target	(1000)
26	"I" Target	(1000)
27	"R" Target	(1000)
28	"E" Target	(1000)
29	"P" Target	(1000)
30	"O" Target	(1000)
31	"W" Target	(1000)
32	"E" Target	(1000)
33	"R" Target	(1000)
34	"A" Rollover	(1000)
35	"B" Rollover	(1000)
36	"C" Rollover	(1000)
37	"D" Rollover	(1000)
38	Left Outlane	(10,000)
39	Right Outlane	(10,000)
40	Orbit Out Gate	
41	Lower Left Jet Bumper	(100/1000)
42	Upper Right Jet Bumper	(100/1000)
43	Upper Left Jet Bumper	(100/1000)
44	Lower Right Jet Bumper	(100/1000)
45	Left Flipper Return Lane	(1000)
46	Right Flipper Return Lane	(1000)
47	Left Kicker	(10)
48	Right Kicker	(10)
49	Playfield Tilt	
50	Not Used	
51	Not Used	
52	Not Used	
53	Not Used	
54	Not Used	
55	Not Used	
56	Not Used	
57	Not Used	
58	Not Used	
59	Not Used	
60	Not Used	
61	Not Used	
62	Not Used	
63	Not Used	
64	Not Used	

NOTE: Second value scored when lit

CHAPTER 5 Unique Parts

UNIQUE PARTS

<u>PART NO.</u>	<u>DESCRIPTION</u>
<u>Backbox</u>	
31-1146-521 C-9939	Screened Backgalss Flipper Power Supply Board
<u>Cabinet</u>	
C-8500 C-9905	Main Transformer Assembly Flipper Transformer Assembly
<u>Playfield</u>	
31-1006-521 C-9915-L C-9916-R D-9935 12-6625 12-6626 B-9801 12-6628 A-8046 A-9920	Screened Playfield Plastics Left Flipper Assembly Right Flipper Assembly Ball Chute Entrance Ramp Ball Chute Guide Wire (Upper) Ball Chute Guide Wire (Lower) Curved Ball Gate Support Assembly Curved Ball Gate Wire Assembly Stationary Target Assembly (Square) Stationary Target Assembly w/Playfield Plastic Support
A-9268 31-1166-521 B-9743	Stationary Target Assembly Stationary Target Decal Screened Spinner Target